STATE OF MINNESOTA DISTRICT COURT

COUNTY OF RAMSEY SECOND JUDICIAL DISTRICT

- -

The State of Minnesota,
by Hubert H. Humphrey, III,
its attorney general,
and
Blue Cross and Blue Shield
of Minnesota,

Plaintiffs,

vs. File No. C1-94-8565

Philip Morris Incorporated, R.J.
Reynolds Tobacco Company, Brown &
Williamson Tobacco Corporation,
B.A.T. Industries P.L.C., Lorillard
Tobacco Company, The American
Tobacco Company, Liggett Group, Inc.,
The Council for Tobacco Research-U.S.A.,
Inc., and The Tobacco Institute, Inc.,

Defendants.

- -

DEPOSITION OF DAVID TOWNSEND

Volume II, Pages 349 - 593

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Source: https://www.industrydocuments.ucsf.edu/docs/qfhd0001

(The following is the continued deposition of DAVID TOWNSEND, taken pursuant to Notice of Taking Deposition, by videotape, at the offices of Dorsey & Whitney, Attorneys at Law, Pillsbury Center South, 220 South Sixth Street, Minneapolis, Minnesota, on October 2, 1997, commencing at approximately 8:39 o'clock a.m.)

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I N D E X

EXHIBITS	DESCRIPTION	PAGE MARKED
Townsend 4809	January 9, 1987 memorandum to file, Bates 50896 7944	410
4810	D. N. Iauco New Brands Status Update, Week of August 10, 1987, Bates 50797 0885-93	413
4811	October 27, 1987 XGT Plan, Bates 50623 6904-7	418
4812	4/4/90 R.J. Reynolds Tobacco USA Authorization Request, Bates 50934 7328-36	439
4813	July 14, 1988 inter-office memorandum, Powell, et al., to XGT File, Bates 50885 6730-35	449
4814	"PROJECT XGT," Bates 51150 3434-78	454
4815	"XGT," Bates 50646 2459-60	470
4816	"Review the use of organic acids and nicotine salts ...," Bates 50893 5926-38	484

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P R O C E E D I N G S

DAVID TOWNSEND

called as a witness, being previously sworn, was examined and testified as follows:

EXAMINATION (cont'd)

BY MR. O'FALLON:

Q. Good morning, Dr. Townsend. Are you ready to go?

A. Good morning. I'm ready.

Q. I'd like to touch for a minute on the use of reconstituted sheet in the cigarette-making process. It's my understanding that in your expert report you talk about the use of reconstituted sheet to -- to effect a general reduction in smoke components. Correct?

A. In my -- in my testimony, I do refer to reconstituted sheet as one tool for general reduction.

Q. You also state in your expert report that what you're trying to do is simplify smoke chemistry and not add to it; correct?

A. That's one overall theme of what we try to do in product modification.

Q. What I'd like to talk for a second -- touch on

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for a second is the amount of ammonia that -- that is added to cigarettes. Do you know when RJR first started to add ammonia to any of its tobacco?

A. I don't know the very first time. I think there's been ammonia used in our processing at different points, at different -- at different times. I don't know the first time offhand.

Q. Okay. What processes is ammonia used in?

A. Well we've used ammonia, of course, in reconstituted tobacco. We've tried some exploratory processes to ammoniate flue-cured tobacco, but I would say -- well and we've also looked at adding ammonia to certain expanded stem materials.

I would say reconstituted tobacco has probably received most of the attention for ammonia addition or ammonia compounds addition.

Q. Is reconstituted tobacco the only component of a commercialized cigarette that's been ammoniated?

A. No, I don't think that's what I said. I think we've looked at -- we've looked at a number of ways. I think expanded stems, there have been commercial products with expanded stems that have added ammonia or actually added ammonia compounds, not ammonia itself.

Q. And the expanded stems, those come out of the

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G13 process?

A. No, they come from a CRES process.

Q. A what?

A. CRES, C-R-E-S.

Q. And what --

What does that stand for?

A. Cut, rolled, expanded stems.

Q. What's the first time that an ammoniated expanded stem was added to a commercial product?

MR. PLESEC: Object to the form.

A. I can give you a general idea. I think it was late '95 or early '96. That's my best guess.

Q. Prior to August of 1994, what components of a commercialized cigarette; that is, commercialized and sold by RJR, were ammoniated?

A. To the best of my knowledge, prior to '94 in commercial products we had several different versions of ammoniated or -- ammoniated reconstituted tobacco or reconstituted tobacco that had some ammonia compound addition.

Q. Is ammonia used in the denicotinization process?

A. It was used in the -- in the burley denic process. We of course used that process for a number of years. We quit using that I guess, I would -- I

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would estimate, maybe four or five years ago.
Q. Did you stop denicoti -- denicotinizing burley four or five years ago, or just did you stop using ammonia to denic it?
A. No, we --
MR. PLESEC: Objection to form.
A. We shut down the denic plant, and my best guess is it was somewhere in the neighborhood of maybe four, maybe five years ago.
Q. Prior to shutting down the denicotinization plant, which was sometimes also referred to as the KDN process -- correct?
A. That's correct.
Q. Where did the tobacco extract that was derived from the KDN process, where did that go?
A. It was incinerated.
Q. Is there any process that's been used by RJR to replace the KDN process?
A. A process to replace the burley denic process? The answer is no.
Q. Well how about just the KDN process itself? Is there any similar process that's been instituted?
A. No, we don't have a similar process at RJR.
Q. What type of extraneous ammonia has been added to the reconstituted sheet?

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MR. PLESEC: Objection.

A. I would say in a general sense there are two ammon -- two types of ammonia compounds that have been added to reconstituted tobacco, and sometimes I may accidentally refer to reconstituted tobacco as G7 because that's our internal nomenclature, so bear with me.

Q. That would be fine because I would also use that.

A. Okay. We have added gaseous ammonia at various points in some formulations of G7. We have used diammonium phosphate at some points in G7.

Q. Diammonium phosphate is usually -- the initials are used, right, D-A-P, DAP?

A. That's correct.

Q. And those are the only two types of ammonia that are added?

MR. PLESEC: Objection.

A. Those are the only two that I can recall. We've had quite a large number of different G7 formulations, and I think those are the two that -- that come right to mind.

Q. Do you know --

Now, gaseous ammonia was the first type of ammonia added to the reconstituted sheet; correct?

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MR. PLESEC: Objection.

A. I believe that's correct. I believe there was an ammoniated G7 that used gaseous ammonia, that that by and large predated the use of other ammonia compounds.

Q. When was the first time that RJR added DAP to its reconstituted sheet?

A. I can't recall the first time. It's been years.

Q. What's your best approximation?

A. Well I'm just guessing. I would say in the neighborhood of eight to ten years ago. That's just a guess.

Q. And what's your understanding of the first time that gaseous ammonia was added to the reconstituted sheet?

A. Well again I'm guessing, but I would say it was before that. I really don't recall the exact time -- time frame.

Q. Other than the reconstituted sheet, is ammonia added at all to tobacco casings?

MR. PLESEC: Objection.

A. I'm not aware that ammonia compounds of any sort are added in any significant levels. There have been experimental programs, I believe, particularly

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looking at DAP as an ingredient at fairly low levels in -- in some casing formulations. I don't -- I'm not aware that -- that those have been commercialized, though. I just really don't know.

Q. Is ammonia added to the paper?

A. The cigarette paper?

Q. Yeah.

MR. PLESEC: Objection to form.

A. Not to my knowledge.

Q. How about to the filters?

A. Not to my knowledge.

Q. Are --

Are any other basic substances added to either the reconstituted tobacco or any other component of the cigarettes?

MR. PLESEC: Objection.

A. Well the term "basic compounds" is -- is -- is a very general and broad statement. I guess -- I guess my best answer to that question is, is that certainly in flavors or topdressing formulations, my guess is that there would probably be some bases present. Frankly I don't know just a whole lot about the formulations of flavors and top-dressings, but that -- that would just be a guess because of the broad, general nature of your question.

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Q. To the best of your knowledge, are any nicotine salts added to any component of the cigarette?

MR. PLESEC: Objection.

A. In commercial products?

Q. Yes.

A. The answer is no.

Q. How about neat nicotine? Is that added to any of the components of a commercialized cigarette?

MR. PLESEC: Objection.

A. Absolutely not.

Q. Is it your understanding that the addition of extraneous ammonia increases the pH of the tobacco smoke?

MR. PLESEC: Objection.

A. It's my understanding that if one uses enough ammonia or enough ammonia compounds, it's entirely possible to increase the pH. At the levels that we use, I don't believe we see an effect on mainstream p -- smoke pH.

Q. What level do you need to use in order to increase the smoke pH of a cigarette?

A. To be exact, I'd have to go back and refer to individual detailed documents, but I would say more than a few percent by weight.

Q. Do you know what the smoke pH was of cigarettes

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manufactured by R.J. Reynolds prior to the addition of any ammonia?

MR. PLESEC: Objection.

A. I've looked at some pH data, and I believe I've been able to locate pH data back as early as 1971 or thereabouts. My guess is that that was prior to the use of ammonia. That's a -- that's probably a reasonable guess, again without going back, looking at the documents, and I believe the pH for commercial products in that time period from what limited data I've seen is, I would say, in the neighborhood of pH of about 6 to 6.2 or 3.

Q. And what was the pH of the smoke of the cigarettes after ammonia was added on a commercialized basis?

MR. PLESEC: Objection.

A. My estimate from looking at data is essentially the same.

Q. What is your understanding about what the pH level of smoke would be from, for instance, a Camel Filter in about 1990?

A. In 1990? I can guess. I think it's in the neighborhood of 6 to, say, 6.3 or thereabouts.

Q. Is there a threshold amount of extraneous ammonia that has to be added to -- to the

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reconstituted sheet before it has any effect on the pH of smoke?

MR. PLESEC: Objection.

A. I don't know that there's a threshold amount. I think cigarette smoke is a highly buffered material, I believe, and I think it takes a significant in -- significant addition of any base like ammonia or certain ammonia compounds to in -- to -- to effect a significant change in pH.

Q. What do you mean by highly buffered compound?

A. A buffered system is one that's relatively insensitive to acid and base addition to change pH, kind of like buffered aspirin. Cigarette smoke because present in cigarette smoke is a large collection of -- of both acids and bases is a very buffered system.

Q. Do you routinely measure the pH of your cigarettes' smoke?

MR. PLESEC: Objection.

A. We don't routinely measure smoke pH. We do have a routine analytical method. It's a standard test method in our -- in our department. We don't routinely measure pH for commercial products, however.

Q. Do you measure it on a -- an occasional basis?

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MR. PLESEC: Objection.

A. We measure -- measure it on an occasional basis.

Q. What's the highest pH of a commercialized cigarette as of 1994 by RJR?

A. We don't go in and survey our commercial products if that's your question.

Q. My question is: What's the highest pH of a commercialized cigarette as of 1994?

A. Manufactured by RJR?

Q. Yes.

A. Well again we have sparse data because we don't make that measurement very often. I would say it's in the range of 6 to 6.3 or 6.4. It seems that -- that our products pretty much cluster in that range, and that's from the available data I've seen.

Q. What percentage or amount of ammonia would have to be added to the reconstituted sheet to effect a change in smoke pH?

MR. PLESEC: Objection.

A. Well this sounds like your question about thresholds earlier. I -- I don't know that there's a threshold. I think if one adds increasing amounts of ammonia or ammonia compounds, one would expect to at some point start significantly affecting the pH. The

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levels that we use in G7 are quite low, and the evidence that I've seen, the information I've seen from our laboratory is that it has an insignificant effect on pH; there is no effect.

Q. That's still not answering my question. What's -- what's the amount that you -- if I add, for instance --

If G7 now has 1 percent ammonia, will that or will that not affect the pH of the smoke?

MR. PLESEC: Objection.

A. I don't know what any threshold would be to cause a statistically significant analytical difference. I've -- I've already testified in an earlier question that I think it would take several percent to substantially affect the pH. We haven't done detailed studies where we go in and measure, to my knowledge, smoke pH as a function of increased ammonia com -- compound.

Q. Wouldn't you agree with me that just as a practical matter holding everything else equal that the addition of a base to a constituent of a cigarette is going to increase the smoke pH?

MR. PLESEC: Objection.

A. That's a reasonable statement, that if one increases the base level in a material, such as

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smoke, that the pH ought to increase. I've already said that it's a buffered system. It's relatively insensitive to small changes. I've already said that, in my opinion, that if one adds a substantial amount of ammonia or any base, one could alter the pH, and we've seen that in experiments.

Q. What --

A. But we haven't done systematic studies where we can define, to my knowledge, a threshold above which addition of ammonia compounds we would see a measurable real increase in pH. I don't know what a threshold is.

Q. So you would agree with me that as a practical matter the addition of ammonia to G7 should increase the smoke pH, but you're not sure how much?

MR. PLESEC: Objection.

A. As a theoretical matter, the increase -- the increased use of ammonia or ammonia compounds in cigarettes should increase the smoke pH. What I said was I think because cigarette smoke is a buffered system, it takes significant levels of those bases added to cigarettes to effect a real increase in pH. I don't know what a specific threshold of addition of ammonia is to cause a statistically significant increase.

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Q. Well I'm not understanding why the fact that it's what you call a buffered system would have any effect, and so I think we need to explore that a little bit.

Presumably tobacco smoke without the addition of ammonia has numerous acids and bases that are released in the smoke; correct?

A. In mainstream smoke, there are numerous acids and bases present.

Q. Okay. If you add a base, another base, to that mix, it would simply stand to reason that that compound is now going to become more basic; that is, the smoke pH is going to increase; right?

MR. PLESEC: Objection.

A. If the system were quite simple, you're absolutely correct. This system is not simple, and because there is some buffering action, addition of small levels of ammonia or any base doesn't significantly affect the pH. Con -- on the -- the other side of the coin is if I add small levels of acids, you don't significantly affect the pH.

Now, if you go to larger levels, of course you will.

Q. Well --

A. But theoretically, back to your question, if the

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system were simple and clean, addition of base theoretically ought to increase pH.

Q. Well there's words in there that -- that concern me, and let me talk about a few of those words.

A. Sure.

Q. You said "significantly affect." How much ammonia would it take to move a cigarette -- the cigarette smoke from a commercialized product from a pH of 6.3 to a pH of 6.4?

MR. PLESEC: Objection.

A. After reviewing pH data, that's within the variability of our analytical method.

Q. That didn't answer my question. How much ammonia do you have to add to G7 to move the smoke pH from 6.3 to 6.4?

MR. PLESEC: Objection.

A. Let me say it again. As a chemist, as an analytical chemist, analytical-type chemist responsible for analytical chemistry, a 6.3 and a 6.4 given the pH measure we have would be the same.

Q. Well that just doesn't make any sense. There has to be some way that you can calculate the amount of ammonia it would take to move smoke from a pH of 6.3 to a pH of 6.4.

A. You said "measure." I'm telling you that

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there's variability in the analytical test method. I don't believe that we can distinguish one-tenth of a pH unit given the method that we have.

Q. Okay. So that's where we're getting into it. Let's go back.

Based on your own knowledge of chemistry and calculations that you do and assumptions you make every day as a Ph.D. in chemistry, how much ammonia does it take added to G7 to raise smoke pH from 6.3 to 6.4?

MR. PLESEC: Objection.

Q. Calculated.

A. Okay. Let me see if I understand your question, and I'm not trying to be difficult; I'm trying to be precise and accurate. Your question is how much ammonia do I have to add to G7 to raise the pH by one-tenth of a unit?

Q. Exactly.

A. The answer is I don't know.

Q. You don't --

You can't calculate that number?

MR. PLESEC: Objection.

A. It's possible theoretically to calculate in a solution the effect of any added base or acid on pH. But that calculation requires that that solution be

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dilute and aqueous. I don't know. You've made a leap, though, to addition of ammonia to G7, which then has to go into a cigarette in a blend at a certain level. That product has to burn, deliver smoke, and then you're asking me to make that leap to the pH of smoke. I can't do that and I don't know of a calculation that can do that.

Q. Okay. How much ammonia does it take to raise the pH of a cigarette -- of cigarette smoke through the addition of ammonia to G7 from 6.3 to 6.5?

A. I don't know.

MR. PLESEC: Objection.

Q. How much ammonia does it take to raise the pH of cigarette smoke from 6.3 to 6.6 through the addition of ammonia to G7 sheet?

MR. PLESEC: Objection.

A. I don't know.

Q. How much ammonia does it take to raise the pH of smoke from 6.3 to 6.8 through the addition of ammonia to G7 sheet?

MR. PLESEC: Objection.

A. I don't know.

Q. Is that all within your measured variability?

MR. PLESEC: Objection.

A. I just said that I think the -- the method is

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variable within a tenth of a unit or so, so I'm not -- I'm not going to even suggest because I think it's not correct that a difference that's large like 6.2 to 6.8 is within variability. I don't -- I believe the method's better than that.

Q. Okay. Well then as measured, how much ammonia does it take to raise the smoke from a cigarette through the addition of ammonia to G7 sheet from 6.3 to 6.8?

MR. PLESEC: Objection.

A. Again I don't know. I'm not aware of any studies that we've done to try to determine the effect of added ammonia on smoke pH.

Q. Now as the pH of smoke rises, the amount of free nicotine in the smoke will also rise; correct?

MR. PLESEC: Objection.

A. Theoretically that makes sense.

Q. How much free nicotine is contained in the cigarette smoke with a pH of 6.3?

MR. PLESEC: Objection.

A. Again I don't know.

Q. How much free nicotine is contained in the smoke of a cigarette with a pH of 6.8?

MR. PLESEC: Objection.

A. Again I don't know.

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Q. You can't calculate that number either?
A. Again using basic principles of chemistry, one could calculate an expected fraction of free nicotine versus protonated nicotine as a function of pH.
Q. Okay.
A. Again that calculation is valid for dilute, aqueous solutions, and cigarette smoke is neither.
Q. Well in fact cigarette smoke is an aerosol that's made up of numerous capsules of aqueous-type solutions, isn't it?
A. I would say it's primarily nonaqueous.
Q. I know it's primarily nonaqueous, but as an aerosol it's made up of gas as well as aqueous droplets; correct?
A. Cigarette smoke is a collection of liquid droplets suspended in a gas phase. Those liquid droplets are primarily nonaqueous. There is water present.
The -- the equations that you're referring to to calculate the fraction of protonated and unprotonated base based on pH is valid for dilute, aqueous solutions.
Q. And it's also valid, I think as you know, for cigarette smoke; right?
MR. PLESEC: Objection.

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A. I don't believe that calculation is valid for cigarette smoke.
Q. And why?
A. Because cigarette smoke is not a dilute, aqueous solution.
Q. So it's your testimony that there's no free nicotine in cigarette smoke?
MR. PLESEC: Objection.
A. That's not what I said at all. There's certainly some free nicotine in smoke. I said I can't calculate it.
Q. And the free nicotine in smoke is going to be a function of the pH of the smoke; correct?
MR. PLESEC: Objection.
A. Theoretically the pH of the smoke should affect the fraction of free base, free nicotine, versus salt nicotine.
Q. So as the pH of the smoke rises, the free nicotine in the smoke will also rise; correct?
MR. PLESEC: Objection.
A. Theoretically that's a reasonable assumption.
Q. You just don't believe that's a fact?
MR. PLESEC: Objection.
A. I don't think we have a way of calculating or measuring it. I'm here to tell you that based on --

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on science I would expect that to be the case.

Q. So you're going to testify that the people at R.J. Reynolds have no way of calculating the amount of free nicotine in cigarette smoke? That's going to be your testimony?

MR. PLESEC: Objection.

A. People have made various attempts to calculate exactly what we're talking about based on the basic equations of chemistry that would estimate the unprotonated and protonated fraction of a base as a function of pH. I'm telling you I don't think that equation directly applies to cigarette smoke because of the assumptions that are wrapped around the use of those equations in the first place.

I don't disagree with the notion that increase in pH ought to increase the fraction of free nicotine. I'm saying that people have tried to calculate it or -- and there have been many people that have tried to calculate it based on -- on these equations. I don't think that they're valid for cigarette smoke.

Q. Why?

A. Because cigarette smoke is neither dilute nor aqueous. Those equations are valid for dilute, aqueous solutions.

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Q. Do you have an alternate calculation?
A. No, I don't have an alternate calculation.
Q. So you've never explored that? You -- you disagree with the calculation that your other chemists have used, but you yourself have never come up with an alternate calculation even though you admit as a matter of common sense and scientific method that there has to be some amount of free nicotine in cigarette smoke and that that amount of free nicotine has to be a function of pH; correct?
MR. PLESEC: Objection.
A. I believe that as a matter of -- of scientific principles, I think that increased pH ought to increase the fraction of free nicotine at the expense of protonated nicotine. I'm not -- I do believe that the calculations that have been conducted using those simplified equations are not strictly correct, and I don't know of a better way -- I mean, I don't know of any way to -- to really calculate it for a system like cigarette smoke.
Q. Have you ever tried to tackle that problem?
A. I've never tried to tackle -- tackle the problem. One scientist in my lab has and really has been largely unsuccessful because of the complex nature of smoke.

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Q. Well if your own scientists can't solve the problem, have you ever thought about getting an outside scientist to try to solve the problem?

MR. PLESEC: Objection.

A. No, I haven't because frankly this is not a big issue for me.

Q. Well is it a big issue for RJR?

MR. PLESEC: Objection.

A. Is what a big issue for RJR?

Q. The amount of free nicotine in cigarette smoke.

A. I don't believe it's a big issue for RJR.

Q. You understand that free nicotine is more readily absorbed; correct?

MR. PLESEC: Objection.

A. I'm not aware of any data that supports that hypothesis.

Q. You don't understand that as simply a matter of chemistry and physics and biology?

MR. PLESEC: Objection.

A. I said I'm not aware of any data that shows that free nicotine is more readily absorbed than protonated nicotine. I think we can speculate, we can talk about my expectations if you like, but again I've never seen data that demonstrates that.

Q. Well what are your expectations, sir?

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A. I think from -- from a superficial knowledge of -- of what might be expected on inhalation -- and again you're talking about absorption by smokers, I suppose.

Q. That is what we're talking about.

A. Right. That superficially I would expect that free nicotine ought to be absorbed probably more rapidly in the oral cavity and maybe upper respiratory tract. I would expect, however, that the protonated nicotine because of the very dynamic and very fast equilibrium between protonated and unprotonated in the lung, the nicotine is still very rapidly absorbed by the body.

Q. But protonated nicotine would still not be absorbed as rapidly in the lung as free nicotine; correct?

MR. PLESEC: Objection.

A. I think you're missing the point about the dynamic nature of cigarette smoke. Protonated nicotine is in rapid equilibrium in the particulate phase with unprotonated nicotine. The unprotonated nicotine can diffuse to the surface of that particle very rapidly. It can evaporate from the surface of that particle very rapidly, diffuse to the lung wall very rapidly. And I don't think it matters just a

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whole lot whether it's protonated or unprotonated in the lung. I think unprotonated nicotine in the oral cavity can alter sensory perception.

In the end the work we've done looking at retention of nicotine shows that most smokers retain essentially all or close to all of the nicotine they inhale.

Q. But I'm not asking you about retention. I'm asking you about speed of absorption, and you'd agree with me that free nicotine will be more quickly absorbed in the lung than protonated nicotine; correct?

MR. PLESEC: Objection.

A. Let me back up because this is -- this is a complicated issue, and I think you are missing the -- the dynamic nature of cigarette smoke.

In the lung the only way -- short of particle capture by the lung, the only way for nicotine to absorb -- be absorbed by the lung is through a vapor-phase transfer mechanism. That vapor-phase transfer mechanism is extremely rapid, we believe, regardless of pH; that as long as there's a high surface area substrate like the lung, as long as there's a high surface-area-to-volume ratio like we have in smoke particles, that -- that the reaction of

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the protonated to form free nicotine and the diffusion of the free nicotine to the surface of the particle, away from the particle and to the lung is an extremely efficient process.

Q. I'm not questioning, sir, that the lung eventually absorbs all of the nicotine, protonated and unprotonated. My question is: Isn't it true that, all things remaining equal, free nicotine will be absorbed more rapidly than protonated nicotine?

MR. PLESEC: Objection.

A. And I'm telling you I don't have a black-and-white demarcation between free and protonated nicotine because of the dynamic nature of that in a particle.

Q. Do you have an understanding that absorption in the lung is in part a function of particle size?

MR. PLESEC: Objection.

A. In a classical sense, I have a superficial understanding of that.

Q. Okay. And is it true that smaller particles are absorbed more quickly than larger particles?

MR. PLESEC: Objection.

A. I think in general for solid particles, smaller particles are retained by the lung more efficiently.

Q. Are you distinguishing between retained by the

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lung and absorbed by the lung?
A. I don't know what "absorbed" means. I know the -- the concept of retention.
Q. Well "absorbed" means absorbed through the lung into the bloodstream. I mean, after all, that is how nicotine works; right?
MR. PLESEC: Objection.
A. Well again I don't understand -- I don't understand details of physiology. I do believe that based on some things I have read that smaller particles will be retained by the lung. What happens once they're retained and exactly the mechanism of their retention, I'm not exactly sure.
Q. And free nicotine is a smaller particle than protonated nicotine; correct?
MR. PLESEC: Objection.
A. Free nicotine is not a particle.
Q. Free nicotine is smaller than protonated nicotine; correct?
MR. PLESEC: Objection.
A. Protonated nicotine by necessity, I believe, resides in the smoke particle. Free nicotine can reside as a -- in a solution in the particle, albeit to a low concentration. Free nicotine can also reside in the vapor phase as a molecule.

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Q. Okay. The free nicotine in the vapor phase is certainly a smaller particle than the larger smoke particle or -- than the larger smoke particle containing the protonated nicotine; correct?

MR. PLESEC: Objection.

A. A vapor-phase nicotine molecule will be considerably smaller than a smoke particle.

Q. Okay. And the vapor-phase free nicotine will be more readily absorbed than the protonated nicotine existing and contained in the smoke particle; correct?

MR. PLESEC: Objection.

A. Again I don't understand your question because of the dynamic nature of the reaction between protonated and unprotonated form. I believe that the majority of the nicotine that's retained by the lung is retained via a vapor-phase transfer mechanism which requires the free nicotine, the unbound nicotine, which evaporates from the particle or is already existent in the vapor phase, which then absorbs on the lining of the lung.

Q. Isn't it true that as the free nicotine from the vapor phase is absorbed into the lung, it will then be replaced by more free nicotine that comes in this dynamic process from the smoke particle containing

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protonated nicotine, and that's the dynamic process whereby as the smoke hits the lung, the nicotine is freed from the acid?

MR. PLESEC: Objection.

A. The nicotine is freed from the acid? I tend to agree with your question up to that last point. I believe you've articulated to a degree the dynamic nature of -- of nicotine transfer, as I was trying to express it, --

Q. Okay.

A. -- that nicotine in a salt form or a protonated form can rapidly disassociate to become free nicotine in the solution, in the particle. It can leave the particle and efficiently absorb through a vapor-phase transfer mechanism to the lung, but that -- once it leaves the particle, I don't believe it's in a protonated form, and so your last phrase in that question I don't understand and certainly don't agree with.

Q. Right. Once it leaves the particle, it -- it's in a free form; correct?

A. Yes, but the clause at the end of your sentence was something like once it hits the lung lining, it's no longer a protonated form or something to that effect. Perhaps you could read it back.

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Q. Well that's okay. I'll move on. I think my sentence will stand for itself.

The fact of the matter is that if -- if a smoker inhales smoke that has 10 percent free nicotine and 90 percent protonated nicotine upon inhalation, it's that 10 percent free nicotine that's going to be first absorbed by the lung; correct?

MR. PLESEC: Objection.

Q. That initial 10 percent of free nicotine is what's going to be first absorbed by the lung and the upper respiratory tract --

MR. PLESEC: Objection.

Q. -- and wherever else it hits; right?

MR. PLESEC: Objection.

A. That that's already in the gas phase or vapor phase I would expect to be absorbed first wherever, in the upper respiratory tract, in the oral cavity or in the lung.

Q. Okay.

A. It's going to be rapidly replenished.

Q. And so if we have two smokes, one with 10 percent free nicotine and one with 20 percent free nicotine, one of those smokes is going to have 10 percent free nicotine rapidly absorbed while the other is going to have 20 percent free nicotine

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rapidly absorbed before the dynamic process kicks in; correct?

MR. PLESEC: Objection.

A. Well using your hypothetical example of 10 and 20 percent, it's hard for me not knowing the relative kinetics of those two processes to say that there will be more rapid absorption in the first case because if the repletion of -- or I'm sorry, if the replenishment of the nicotine in the vapor phase from the particulate phase is extremely rapid, it's quite possible there may -- may be no difference at all.

But again, as I said earlier, I'm not aware of data that clearly demonstrates that there's a difference in speed of absorption in a physiological sense.

Q. Well in any event, the free nicotine is going to be in front of the protonated nicotine even in a dynamic process; correct? I mean, we could view these as two race cars, one going 10 miles an hour, one going 20 miles an hour. You know, over time the absolute decrease, if -- if -- if one car is going 10 miles an hour and one car is going 11 miles an hour, you know, if you go 100 miles, you know, the difference between the amount of space they've covered in that time grows smaller, but the fact of

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the matter is one is always ahead of the other; right?

MR. PLESEC: Objection.

A. In your example, one car is always ahead of the other.

Q. And that's --

A. However, in cigarette smoke I don't view them as discrete parcels or discrete cars.

Q. Well --

A. I said it's a dynamic equilibrium. I can look at your hypothesis that there's a difference in absorption rates and I could conclude that that's a reasonable hypothesis from one point of view. I can also conclude that there may be no difference because if the -- if the equilibrium between particulate and vapor-phase nicotine is extremely fast, as we believe it is, then the replenishment of vapor-phase nicotine may be so fast that it doesn't matter to overall absorption.

I think there's two hypotheses at the extreme there, and all I'm saying is I'm not aware of data looking at blood nicotine levels as a function of time in a controlled fashion that demonstrates that one or the other hypothesis is operative.

Q. Let me just ask you another question. Let's go

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back to my example of the 10 percent free nicotine. Once that 10 percent of free nicotine is absorbed, it's then going to be replaced by another in essence 10 percent of free nicotine, right, I mean, again because you've got a system that's in dynamics and so that new unprotonated nicotine is going to be coming forward to replace that which has been absorbed; correct?

MR. PLESEC: Objection.

A. I think using -- using your hypothetical estimate of 10 percent nicotine, as that is absorbed by the body in whatever location of the body, there's going to be replenishment of the vapor phase. That's what I would theoretically expect.

Q. That 10 percent of free nicotine is going to be replenished; correct?

A. The degree of vapor-phase nicotine in the lung environment or in any environment depends on that environment. We measure -- if -- if you were to -- to in some controlled fashion measure the level of free nicotine and then you take smoke and put it in another environment like the lung where there's high humidity and a very different environment, I don't know that it would be exactly the same fraction of free nicotine versus particulate. But I do believe

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that there will be this extremely rapid dynamic equilibrium.

Q. And in part that the rapidity of that dynamic equilibrium is going to be a function of the initial percentage of the smoke that's in an unprotonated form from the get-go; correct?

MR. PLESEC: Objection.

A. That's what I tried to say in the last answer, is I don't believe that we can say that based on what we -- what we have today.

Q. What do you mean by that?

A. You're assuming that a certain percentage of free nicotine is always -- for a given smoke is always going to be that same percentage of free nicotine. I said in the answer to the earlier question -- I hope I made myself clear -- that I think the percentage of free nicotine versus particulate-phase nicotine or salt nicotine is a function of the environment.

So I can't say that a particular smoke with this fraction of -- of free nicotine is always going to maintain that fraction of free nicotine. I can't say that.

Q. But if you take two smokes, one with 10 percent and one with 20 percent free nicotine, that ratio is

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basically going to remain constant between those two because they're going to go into the same environment; right? So again there's always going to be more free nicotine in one than the other, and that's true even in a dynamic constant given the fact that it's all going into the same environment; correct?

MR. PLESEC: Objection.

A. That's what I'm saying. As a scientist, I can't say that that ratio is always going to stay the same because the environment's different. We know that there's water growth on the particulate phase. We know there are other changes as the nicotine is depleted from the particulate phase. The -- the -- the equilibrium between the salt and the free nicotine ought to change.

I can't sit here today and tell you as a scientist that that ratio is going to stay the same.

Q. But both substances are going into the same environment; therefore, whatever impact the environment has on one substance, it will have an equal impact on the other substance, and all things remaining equal, the relative percentages of free nicotine ought to remain; correct?

MR. PLESEC: Objection.

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A. Again I don't think I can sit here as a scientist and tell you that the -- the percentages of free nicotine, the ratio of those percentages, would necessarily stay the same.
Q. You --
A. I don't know.
Q. Okay. You just don't know whether they stay the same or not?
A. That's what I've been trying to say.
Q. Okay. Have you ever explored that issue at R.J. Reynolds?
A. I'm not aware of such studies.
Q. Okay. So as you sit here today, you couldn't say that my hypothesis on free nicotine is wrong? You simply don't know whether it's right or wrong?
A. What I did was I -- I told you that I can think of two hypotheses that are extremes from each other. There's your hypothesis. There's another hypothesis which I suggested. I don't know which are operative, if either of them.
Q. But you will agree as to your hypothesis that, as I understand your hypothesis, your hypothesis is based upon the environment that the smoke is going into, and isn't it true that the smoke that we're talking about will be going into the same

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environment? So in essence, between both of the systems we're comparing, that environment is a constant?

MR. PLESEC: Objection.

A. If we assume that the initial environment is a constant, I still can't as a scientist tell you that that environment won't change the two systems differently. It may. I don't know. I'm not aware of data -- to your -- to your broader question, I'm not aware of data that's been generated looking at speed of absorption by measuring nicotine levels in the blood as a function of smoke pH or as a -- as a measure of free nicotine or -- or any of those parameters.

I think that's the kind of experiment it would take. Again I'm not a physiologist. I'm not a biologist. But I think those are the kinds of experiments superficially I think it would take to determine that.

Q. Do you know --

A. We can -- I'm sorry. We can sit here and develop hypotheses probably all day long, and I don't think it -- I don't think it would get us anywhere except maybe suggest other ways to do experiments. And then I think in the end that's what -- what needs

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to be done, is to generate experiments.
Q. Does R.J. Reynolds measure the amount of free nicotine in any of its commercial cigarettes?
MR. PLESEC: Objection.
A. We've tried to develop a method for measuring free nicotine. We've done some comparison studies, and I don't believe there is a good measure for free nicotine. I've already told you I don't think we can calculate free nicotine, so we tried to measure it. I don't think there is a good measure.
We've looked at a few commercial cigarettes, compared them to a few experimental prototypes, and we've collected data. And we do see differences in that measure, but I don't think it's -- that measure is able to determine relative differences, but I don't think that measure is able to quantitate a percentage free nicotine frankly.
Q. What measures did you take and what cigarettes did you test?
A. Well let me back up and tell you about the experiment. The experiment that was conceived at Reynolds was essentially to use what's called a denuder tube. A denuder tube is --
Q. I don't mean to interrupt --
A. Yes.

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Q. -- but I don't need to know, you know -- this is the kind of thing, you know, I don't need to know how you build a car in order to know how fast it goes. I just would like the -- the numbers.

A. I'm here to answer -- I'm here to answer your questions, and I'm --

Q. Great. Well what I asked -- what I asked -- what I asked you were: What were the measures? What was the amount of free nicotine that you measured and in what products?

A. Okay. I thought you meant -- when -- when you said "what were the measures," I thought you meant a description of what --

Q. No, I meant measurements, so that's my fault. I -- I asked an unclear question, and I'll restate my question. What were the --

What were the measurements of free nicotine that you -- that you obtained and on what products?

A. I can't recall the exact data from those experiments. There have been a number of experiments conducted. We've looked at a few commercial products like Marlboro, Marlboro Lights, Winston, Winston Lights and maybe a Camel product. And most of the work that we conducted using those experiments were conducted to -- to evaluate certain experimental

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prototypes, particularly in the XB program, and compared those experimental prototypes from the XB program to those handful of commercial products used as references.

Q. Okay. What were the measurements of free nicotine for Marlboro?

A. I don't remember exact data.

Q. How about Marlboro Lights?

A. Again this experiment, which you didn't want to hear about, doesn't, in my estimation, calculate a percentage free nicotine. It does show relative differences in this artificial experiment.

Q. Well I see that whether I wanted to hear about it or not, you're bound and determined to tell me about it.

A. No, I --

MR. PLESEC: Objection now. You're arguing with the witness. He's answering your questions.

MR. O'FALLON: Oh, no, he's not.

MR. PLESEC: Yes, he is. He is answering his -- your questions to the best of his ability based on his understanding of what you're asking him. Now if you don't like his answers, ask him another question.

MR. O'FALLON: I did that, sir.

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MR. PLESEC: Well let's proceed.

MR. O'FALLON: Didn't I?

MR. PLESEC: Let's proceed. He is responding to your questions in -- in the best fashion that he can. If you don't understand his -- his answers, then you start asking him about his answers to find out if you can glean the understanding that he's trying to convey.

MR. O'FALLON: Would you like to come over here and take the deposition?

MR. PLESEC: I'm not here to take his deposition; you are.

MR. O'FALLON: If you've got an objection to make, make it.

MR. PLESEC: I made the objection, but don't argue with the witness and tell him that he's not answering your questions.

MR. O'FALLON: Don't you lecture me. I don't want to listen to you lecture me anymore --

MR. PLESEC: Well --

MR. O'FALLON: -- unless you want to come over here --

MR. PLESEC: -- look --

MR. O'FALLON: -- and take this deposition. Okay?

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MR. PLESEC: -- we're bound under court orders to be courteous to one another and to the witness.

MR. O'FALLON: We're also --

MR. PLESEC: The witness --

MR. O'FALLON: -- bound to answer questions.

MR. PLESEC: Excuse me, I'm speaking. The witness is here to answer your questions. He's trying to do that to the best of his ability. If you don't understand his answers, then you ask him about the answers he's providing you.

MR. O'FALLON: There's nothing I didn't understand about his answers.

MR. PLESEC: Okay. Then let's proceed. Don't -- don't harass the witness then.

BY MR. O'FALLON:

Q. As you sit here today, you can't tell me what the measures of free nicotine were from the experiments you've just outlined; correct?

A. What I believe I said or I certainly tried to say was that this particular experiment I don't believe can give us definitive percentages of free nicotine versus bound nicotine. It does, however, show differences among a handful of commercial

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products used as reference versus some experimental prototypes that we developed under the XB program. We can see differences, but I can't sit here and tell you that there's a def -- I can't quote numbers that definitively relate to percent free nicotine.

Q. Well quote me the numbers that you generated.

MR. PLESEC: Objection.

A. I'd have to go back and pull out the report and do so.

Q. Okay. And there are those numbers in the report; right?

A. There are numbers in report, but it's not numbers as to free nicotine percent.

Q. What is it?

A. Nicotine captured in the denuder experiment under that particular set of conditions.

Q. Okay. And what was the amount of nicotine captured?

A. I don't remember the details.

Q. Okay. Did Marlboro have more free nicotine than Marlboro Light?

A. In that particular comparison, I don't remember.

Q. Did Marlboro have more free nicotine than Winston?

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A. It's my recollection that there was more nicotine trapped by the denuder tube for Marlboro smoke compared to Winston smoke.
Q. Does that mean it had more free nicotine, as you were trying to measure it, than Winston?
MR. PLESEC: Objection.
A. That would be a logical first conclusion.
Q. Did you measure the pH of the smoke of those four products?
A. I believe we measured smoke pH as part of that overall experiment.
Q. And was the amount of nicotine captured a function of the smoke pH?
A. I don't recall such a correlation.
Q. Did Marlboro have a higher pH than Winston?
A. For those particular cigarettes, I don't believe it was substantially different.
Q. What do you mean by "substantially different"?
A. Within a couple pH units of each other.
Q. So it could have been 6.3 to 6.6?
MR. PLESEC: Objection.
A. I'm not -- no, I don't recall it being that different. I would say a -- a tenth of a pH unit or -- or two maybe, which is --
Q. So 6.3 to 6.5?

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A. -- which is close to the variability of our analytical method.

Q. You can only get within what, two pH points?

MR. PLESEC: Objection.

A. If we repeatedly measure one sample, one sample of cigarettes, over and over, we see plus or minus about a tenth of a unit, so the total spread would be about two-tenths of a pH unit.

All I'm sitting here telling you today is that I don't think that the difference in smoke pH between that sample of Marlboro and that sample of Winston was large. It was with -- within a couple pH tenths, tenths of a pH unit, as I recall.

Q. And tenths of a pH unit can have a significant impact on the percentage of free nicotine; correct?

MR. PLESEC: Objection.

A. We've already talked about this. Theoretically I would agree with you that increased pH would increase the free nicotine. I don't know in -- in this particular buffered system to what extent it really does.

Q. That wasn't my question. I said that tenths of a pH unit can have a significant impact on the percentage of free nicotine; correct?

MR. PLESEC: Objection.

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A. And what I'm telling you is I don't know how to translate pH units to percent free nicotine.
Q. So you can neither agree nor disagree with my statement; correct?
MR. PLESEC: Objection.
A. I don't know how to relate pH units to percent free nicotine.
Q. Which is the same as saying that you can neither agree nor disagree with my statement; correct?
A. I think I've made it clear what I think about this issue. Increased pH theoretically should increase free nicotine. I'm telling you that as a scientist I don't know how to calculate percent free nicotine from a pH measurement.
Q. Does the addition of ammonia affect the nicotine transfer efficiency of a cigarette?
MR. PLESEC: Objection.
A. How do you define "nicotine transfer efficiency"?
Q. How do you define it?
A. Well I think that's why I asked you, because I think people in the tobacco industry have defined it in different ways in the -- in the literature.
Q. Well why don't you tell me how you at R.J. Reynolds define "nicotine transfer efficiency."

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A. There's two ways, and the first is if one determines the total nicotine or the total amount of any constituent in the -- in the tobacco rod and then you measure what's in the mainstream smoke, it's that fraction that actually gets into smoke. That's what I would call gross transfer efficiency. I think there are -- there is a more detailed transfer efficiency that leads to better insight of what happens in the burning cigarette, and that would be to take the gross transfer efficiency and correct it for differences in physical characteristics of the cigarette, such as different tobacco weights.

Q. By either definition, does the addition of ammonia affect nicotine transfer efficiency?

A. I've not calculated nicotine transfer efficiency with and without ammonia. I can tell you that we've looked at the nicotine yield, everything else as constant as we can hold it, with and without ammonia compound addition, like diammonium phosphate, for example, and we see no difference in nicotine yield with or without ammonia.

Q. But you've never looked at nicotine transfer efficiency?

A. If everything else were in fact the same, the nicotine content in the tobacco rod should be the

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same. I'm telling you that I think the yield is not affected by moderate levels -- moderate to low levels of ammonia or ammonia compounds. Then the nicotine transfer efficiency should also not change. But I haven't done that calculation. I have looked at nicotine yields.

Q. So if we take a burley sheet with "X" amount of nicotine and compare that burley sheet as it is with that burley sheet with ammonia added, the nicotine yield from each burley sheet upon burning will be the same?

MR. PLESEC: Objection.

A. You're talking about burley reconstituted sheet?

Q. I'm just talking about a piece of tobacco.

A. Well we've not done an experiment with a piece of tobacco. What we have done is looked at blends where we've compared, for example, a G7 ammoniated or not, and we've looked at nicotine yield from that cigarette and we see no difference.

Q. Well how about just the G7 itself? Have you ever compared ammoniated G7 and unammoniated G7 where all other constants are held equal and determined the amount of nicotine yield from each of those two relevant reconstituted sheets?

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MR. PLESEC: Objection.

A. I don't think that's a relevant experiment to try to -- try to measure nicotine transfer from one particular tobacco type. We've done some of that in the past and it really hasn't given us anything. I think what's important is does it affect the yield from the finished cigarette, which is a blend, so the specific answer to your question is we've never done that.

Q. So you've never actually compared ammoniated G7 to regular unammoniated G7 to determine the relative nicotine transfer efficiencies from those two reconstituted sheets; correct?

MR. PLESEC: Objection.

A. I'm not aware of such an experiment.

Q. Please list for me all the ways that R.J. Reynolds has incorporated for altering the tar-to-nicotine ratio of cigarettes.

MR. PLESEC: Objection.

MR. O'FALLON: What's your objection?

MR. PLESEC: All the ways?

MR. O'FALLON: Yes. What's --

MR. PLESEC: Forever, when?

MR. O'FALLON: Yeah. You've got some ambiguity about that?

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MR. PLESEC: I do.

BY MR. O'FALLON:

Q. Do you have any ambiguity?

A. Can you ask the question again.

Q. Please list for me all the ways that R.J. Reynolds has incorporated for altering the tar-to-nicotine ratio of cigarettes.

A. In commercial products?

Q. Yes.

A. In commercial products I'm not aware of techniques being used to alter tar/nicotine ratios. We have used a variety of techniques for reducing tar yields and nicotine yields, but specifically as an objective for changing the tar-to-nicotine ratio, I'm not aware of design tools being implemented in commercial products.

Q. Okay. I didn't ask you whether the intent was to alter tar-to-nicotine ratio. What I'm asking is the effect. So please describe for me all the ways that R.J. Reynolds has incorporated that do in fact alter the tar-to-nicotine ratio of cigarettes.

A. Okay.

MR. PLESEC: Objection.

A. All right. If I understand your question right, it's what tools have we used at Reynolds that

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ultimately do affect tar-to-nicotine ratio.

Q. Right.

A. And my answer is I think there's a number of cigarette design tools, especially and probably foremost the use of filters and more efficient filters, particularly with air dilution -- excuse me, air dilution and in particularly high levels of air dilution. Those two design parameters interact substantially and do have significant effects on the tar-to-nicotine ratio.

Those are the major design tools. I think some less important design tools include more porous and faster-burning cigarette papers will to a much, much, much lesser degree sometimes affect the tar-to-nicotine ratio.

Q. And that's everything?

A. Well I don't know that that's everything. I mean, obviously you can speculate that the use of -- of KDN would alter the tar-to-nicotine ratio to a small degree, and the difference is -- and -- and I say "to a small degree" because it's used only as -- or it was used as -- as only a small -- a relatively small portion of the blend.

Q. Why would KDN affect the tar-to-nicotine ratio?

A. Because the KDN process lowered the nicotine

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level of that burley sample.
Q. And it lowered the nicotine content more than it lowered the tar content?
A. I believe that the KDN process by removing the nicotine lowered the -- lowered the nicotine level of course, which should lower -- to the degree that it's incorporated in a blend should somewhat lower the nicotine yield from that tobacco rod, and the tar level would stay a little bit higher. The tar level wouldn't be affected as much as the nicotine in that process.
Q. Okay. Now the KDN process didn't remove all the nicotine; it just removed some of the nicotine. Right?
A. Of course. We only removed some of the nicotine.
Q. The KDN process was basically a nicotine control mechanism so that you could regulate the amount of nicotine in your burley tobacco to maintain certain specs for the nicotine; correct?
MR. PLESEC: Objection.
A. We see -- we see huge swings in the nicotine level in the tobacco we buy with different agricul -- with different crops. That's a function of the weather. Nic -- burley, it turns out, is one of the

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higher-nicotine types of tobacco, and the -- the KDN process was an attempt to control the large swings in a very high-nicotine tobacco material that resulted from crop differences.

Q. Right. It was developed to maintain a nicotine level in your final cigarette so it wouldn't be subject to the variations of your crops; right?

A. It was a way of maintaining consistency of our products.

Q. Right. What's the maximum effect that filters and air dilution combined has had on the tar-to-nicotine ratio?

MR. PLESEC: Objection.

Q. I believe --

A. Yeah. Go ahead.

Q. Why don't we -- in order to do this, I think it might be helpful to just start with the typical tar-to-nicotine ratio, which would be about what, 15?

MR. PLESEC: Objection.

A. I would say 13, 14, but --

Q. Okay, okay.

A. -- in that ballpark.

Q. Well why don't you pick the number. What one would you -- I mean, I just want to do this for

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comparison purposes --

A. Okay.

Q. -- because I'm going to ask you next, is then what's the maximum effect that your air dilution and filter combined had on moving the tar-to-nicotine ratio. And if we start with 13, is 13 an acceptable number to start with?

A. Yeah, 13, 14, any -- anywhere in that range. I guess -- okay, go ahead and ask your question.

Q. If we start with 13 as the typical tar-to-nicotine ratio, what's the maximum effect that air dilution and filters have had on that tar-to-nicotine ratio?

A. Both in combination?

Q. Why don't we take them individually first and then in combination.

A. Well I can't answer your question individually. I can from the marketplace try to speak -- speak to your question in combination --

Q. Okay. Well let's --

A. -- because we -- excuse me -- because we haven't -- I don't remember experiments where we've sat down and specifically varied filtration efficiency, everything else constant, and looked at T/N ratios.

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Q. Then let's speak of them together and let's --
A. Sure.
Q. And what I'd ask that you do is refer to commercialized R.J. Reynolds products.
A. Sure. Cigarettes on the market that are higher-tar products with low or no air dilution and moderate filter efficiency typically have tar-to-nicotine ratios in the neighborhood of 13 or 14, thereabouts. Combination of more -- more efficient filters together with the use of high air dilution levels; for example, in the case of ultralight-tar products, brings the tar-to-nicotine ratio down to maybe 10, in that range.
Q. Okay. Now does the addition of any of these other factors; that is, the more porous paper and faster-burning paper or the addition of KDN, is that able to move that tar-to-nicotine ratio any lower than 10? What's the lowest tar-to-nicotine ratio product you have?
A. I don't know the lowest because I haven't done that survey, but I would say it's in the neighborhood of 10.
Q. And what would that product be; do you know?
A. Now.
Q. What percentage of the products that RJR sells

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have a pH -- or have a tar-to-nicotine ratio in the 13 to 14 area?

MR. PLESEC: Objection.

A. I would say the majority.

Q. As high as 60 to 75 percent?

A. Most of our business is in the full flavor and the full-flavor lights. I would say a minimum of 60 percent, probably higher.

MR. O'FALLON: Okay. Why don't we take a break.

THE REPORTER: Off the record, please.

(Recess taken.)

BY MR. O'FALLON:

Q. Doctor, I just want to come back quickly to the ammoniation of the G7 reconstituted sheet, and it's my understanding that it was reconstituted with two -- it was ammoniated with two substances, gaseous ammonia and then DAP. Could you please explain to me how the gaseous ammonia is added to the reconstituted sheet.

A. Well let me make it clear that -- that there were different formulations. Some formulations had gaseous ammonia and I believe some different formulations had DAP, and I don't remember a formulation that included both. Okay.

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No, the -- the mechanical process of adding gaseous ammonia I don't really recall.

Q. Do you recall at what point in the reconstituting process that the gaseous ammonia was added?

A. No, I don't.

Q. Was the gaseous ammonia added to the extract or was it added to the reconstituted sheet after it had been reassembled?

A. I --

MR. PLESEC: Objection.

A. I don't know.

Q. How about the DAP? Where was that added in the process; do you know?

A. I believe the DAP was added to the extract.

Q. And it would be added before the extract was sprayed back on to the reconstituted sheet; correct?

A. It would be added to the holding tank that held the -- the extract before spraying back on to the paper sheet.

Q. I'd next like to turn to the issue of nicotine manipulation and several of the projects that R.J. Reynolds has done to explore nicotine manipulation.

(Discussion off the stenographic record.)

(Plaintiffs' Exhibit 4809 was marked

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for identification.)

BY MR. O'FALLON:

Q. Plaintiffs' 4809 is a document Bates stamp numbered 50896 94 -- 7944. Have you seen this document previously?

A. I don't recall seeing this specific document.

Q. The subject of this document is "L-Nicotine Levulinate Focus Group Testing"; correct?

A. That's the title.

Q. Okay. Do you recall in 1987 that R.J. Reynolds was looking at the addition of L-nicotine levulinate to cigarettes?

A. I do recall that.

Q. Okay. It states the "Tar to nicotine ratios of in-market" R.J. Reynolds "brand styles are between" 9.1 and 15 -- strike that.

It says "Tar to nicotine ratios of in-market RJR brand styles are between" 9 point -- "9 to 1 and" 5 -- "15 to 1"; correct?

MR. PLESEC: Objection.

A. That's what it says, that's right.

Q. It then states that "It would be advantageous to be able to develop cigarettes whose tar-to-nicotine ratio is lower, particularly in the ULT and FFLT 'tar' categories"; correct?

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MR. PLESEC: Objection.

A. That's what it says.

Q. It then states that "If 'tar' is held constant and nicotine deliveries are elevated, then tar-to-nicotine ratio can be effectively lessened"; correct?

MR. PLESEC: Objection.

A. That's what it says.

Q. It then states that "Permission is requested to begin Focus Group Testing of N-85, WUL-100, and CL-85 whose nicotine deliveries have been" boostered -- "boosted by the addition of L-nicotine levulinate to tobacco cut filler"; correct?

MR. PLESEC: Objection.

A. That's -- you read that correctly.

Q. Do you recall this project?

A. I do recall this project.

Q. Is N-85 a Now prototype?

A. Yes, that's Now 85.

Q. Okay. And WUL, is that Winston Ultra Light?

A. That's correct.

Q. And CL-85 is a Camel Light?

A. That's correct.

Q. Do you recall the results of this testing?

A. I recall in general the results of -- in a

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general sense of a number of smoker consumer testing of -- of products with added nicotine levulinate.

Q. And what do you recall?

A. They were generally consumer unacceptable.

Q. How so?

A. Generally too harsh, too strong, too irritating, particularly in the upper throat and in the oral cavity.

Q. Is that because they had too much nicotine in the smoke?

MR. PLESEC: Objection.

A. I believe it's because for that given -- for -- for the given tar level, I think the nicotine level was too high. I think the tar-to-nicotine ratio for these products was outside the limits of consumer acceptance.

Q. And you never commercialized any of these particular prototypes?

A. No, we've not.

(Plaintiffs' Exhibit 4810 was marked for identification.)

BY MR. O'FALLON:

Q. Plaintiffs' 4910 is a document Bates stamp numbered 50797 0885 through 08 --

MR. PLESEC: Excuse me, Dan. I think it

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Source: https://www.industrydocuments.ucsf.edu/docs/qfhd0001

was marked as 4810 and you meant -- you said --

MR. O'FALLON: Oh, I said 49.

MR. PLESEC: -- "4910."

MR. O'FALLON: Yeah, you're right.

Q. Plaintiffs' Exhibit 4810 is a document Bates stamp numbered 50737 0885 through 0893. Have you seen this document previously?

A. I don't remember seeing this document, no.

Q. D. N. Iauco is a marketing person; correct?

A. That's correct.

Q. And this document is dated August 10th of 1987; correct?

A. That's when this document's dated.

Q. I'd like you to turn to page eight of this document. Under Roman numeral V it lists a "Project GT." Are you familiar with that project?

A. I am.

Q. Is this about the time that that project started?

A. I can't recall the exact time that GT started. It's about the time GT was in fact in -- underway. I don't remember whether that was when it started.

Q. Project GT is a project to offer smokers a product which delivers full, rich, satisfying taste commensurate with current higher-tar products at a

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disproportionately lower level of tar; correct?

MR. PLESEC: Objection.

A. That's what's stated here as the objective of GT.

Q. And it says you're going to accomplish this by using existing and emerging product technologies; correct?

MR. PLESEC: Objection.

A. That's what it says.

Q. Are those emerging technologies this nicotine manipulation technology?

MR. PLESEC: Objection.

A. By "nicotine manipulation," you mean what?

Q. Well let's go down to Project XGT.

A. Okay.

Q. Do you see under "Project Development" it says "To meet the objective for XGT requires a longer term product development exploratory which will focus on the recently discovered 'nicotine salts' technology"? Correct?

MR. PLESEC: Objection.

A. That's what it says.

Q. "'Nicotine salts' facilitate manipulation of nicotine delivery, thereby increasing satisfaction without increasing 'tar'"; correct?

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MR. PLESEC: Objection.

A. That's what it says.

Q. Is that the technology referred to under Project GT?

A. That's one technology that was considered under GT.

Q. What was the other technology?

A. The use of high-nicotine tobaccos.

Q. Did RJR pursue any projects to chemically engineer higher-nicotine tobaccos?

MR. PLESEC: Objection.

A. We have -- we have an experimental farm called the AVOCA farm. At that farm we have agronomy experts who try to develop new strains of tobacco. At various points in the past they have looked at strains of tobacco that might generate higher tobacco nicotine levels. They've also worked with some members of USDA in the past also trying to do the same sort of thing.

Q. Have they been successful in developing a genetically engineered higher-nicotine tobacco?

A. Well you're mixing two concepts. We are working on some genetic engineering, but I'm not aware that genetic engineering has been successful in high-nicotine tobaccos that we've done at AVOCA. I

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do believe that there are some high-nicotine tobacco -- tobacco varieties that we've looked at and developed up to a point. I'm not aware that they're commercial, though.

Q. Have you also undertaken to contract out for genetic engineering of higher-nicotine tobaccos?

MR. PLESEC: Objection.

A. I'm not aware of such a contract. I know there's been discussions and some cooperative work with the USDA. Under contract, I don't know.

Q. What genetic engineering have you done relative to tobaccos?

A. There is genetic engineering research underway now to try to develop pest- and mold-resistant varieties of tobacco.

Q. These two projects, Projects GT and Project XGT, are they considered interrelated projects?

A. I consider them interrelated.

Q. What's the difference between the two?

A. Well let's turn to the -- to the stated objective as it is in this document. Project GT is, in my estimation, a more general objective; that is, using existing and emerging product technologies to develop a product with full-flavor taste but with FFLT tar levels and a product with FFLT taste but

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with ultralow-tar tar levels.

Whereas, XGT I think is more specific a product objective, to offer smokers a product which delivers taste and satisfaction commensurate with a 7- to 9-milligram tar product with 1 to 2 milligram tar. The -- so product XGT had a specific tar target; whereas, I think GT was just a more general product development approach.

Q. Did Project GT result in a commercialized product?

A. No, it didn't.

Q. Did Project XGT result in a commercialized product?

A. No, it hasn't.

(Plaintiffs' Exhibit 4811 was marked for identification.)

BY MR. O'FALLON:

Q. Plaintiffs' 4811 is a document Bates stamp numbered 50623 6904 through 6907. Have you seen this document previously?

A. It looks familiar. I can't place where I -- where I've seen it, but it looks familiar.

Q. This is a document dated October 27th of 1987; correct?

A. That's correct.

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Q. It's the "XGT PLAN"; correct?
A. The title of it is "XGT PLAN."
Q. Under Roman numeral I, it indicates that you're going to be applying nicotine levulinate salt to cut filler; correct?
MR. PLESEC: Objection.
A. That's what it states.
Q. Where did you obtain the nicotine levulinate salt?
MR. PLESEC: Objection.
MR. O'FALLON: What's your objection?
MR. PLESEC: Form of the question assumes that it was obtained.
You can answer.
That's my objection. It's stated.
A. We conducted work in the laboratory to try to prepare nicotine levulinate in our laboratory. We went, as I recall, to a contractor to see if they could prepare and sell to us nicotine levulinate.
Q. Could they?
A. I believe they did in small quantities.
Q. Is cut filler a part of every cigarette?
A. "Cut filler" is a term we use to denote the finished blend as cut and ready for tobacco rod manufacture.

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Q. So you were actually applying nicotine levulinate to the overall final blend?

MR. PLESEC: Objection.

A. That would be -- my interpretation of this statement is the final cut blend ready for the cigarette maker would in fact have nicotine levulinate salt applied.

Q. So in other words, this would be after you've added your -- your filler -- or after you've added your expanded tobacco and your -- your reconstituted tobacco to your regular tobacco and formed it all together, and so this would be sprayed on the line before it was made into a final cigarette?

A. That's the way I would interpret what's said here. I think that's an impractical approach and it's not the way I would do it. I don't think that's the way it would be done commercially.

Q. But that's how it was done experimentally?

MR. PLESEC: Objection.

A. Well experimentally is -- is different because we don't -- in -- in -- in preparing experimental prototypes, we in fact blend tobaccos in a small drum. It's in the -- and that tobacco can be blended in a small drum even after casing and after cutting, which can then be taken to a laboratory cigarette

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maker, so I don't think that has direct application to a manufacturing environment.
Q. Did I ask you whether it did?
A. I'm just trying to help -- help --
Q. Answer --
A. -- you understand.
Q. Well, what I need is an answer to my question.
A. Well --
Q. I'm just asking you that's how it was done experimentally. That's how you did it here in this experiment; correct?
A. From --
MR. PLESEC: Objection.
A. Specifically to your question, from the way this is written, I would assume that's the way it's done.
Q. Okay.
A. I don't think that's commercially the correct approach.
Q. It would just be a lot more helpful if you'd answer my question. I didn't ask you about the manufacturing process.
A. Okay. Well, please excuse me. I'm just trying to help you. I'm trying to answer the question as completely as I can to help you. Part of the -- part of the problem is that I tend to like to teach. I --

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I want you to understand, you know, the situation, so please forgive me for being -- for trying to be complete.

Q. Roman numeral II says you're going to apply nicotine and then levulinic acid solution to cut filler. How does that differ from the above process explained in Roman numeral I?

MR. PLESEC: Objection.

A. My estimation is that one would apply nicotine in some carrier solvent together with levulinic acid in the same carrier solvent, and that would be applied directly on cut filler.

Q. Okay. So you'd --

You'd take a nicotine salt and a levulinic acid in some kind of solution? Is that your understanding?

A. No, that's not my understanding.

Q. Okay. Would you take neat nicotine in a solution and levulinic acid?

A. The way I would interpret this statement, you would take nicotine, --

Q. And what --

A. -- free nicotine, --

Q. Okay. Neat --

A. -- in solution and add to it levulinic acid to

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the same solution and apply that to cut filler.
Q. Free nicotine's also referred to as neat nicotine; right?
A. Well "neat" is a term we use in chemistry to -- to imply pure nicotine.
Q. Right.
A. Nothing else, just pure.
Q. When nicotine and levulinic acid are placed in the same solution, will that result in levu -- nicotine levulinate?
A. Nicotine's a base. Levulinic acid is an acid. They should react and form a salt.
Q. So in each case you'd be applying nicotine levulinate; you'd just be going at it in a different way. In the one case, you're actually making nicotine levulinate and then suspending it in a solution. In the other one, you're basically taking the two base components and putting in -- putting them into a solution where they will probably combine to some extent; correct?
MR. PLESEC: Objection.
A. I think that's a reasonable description. I think when you mix nicotine and levulinic acid, you should form nicotine levulinate.
Q. And would that be true generally? If you would

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add levulinic acid to any solution that contains nicotine, would you in all likelihood form some nicotine levulinate?

MR. PLESEC: Objection.

A. In all likelihood, there would be formation. The degree of the formation would depend on whether or not there are other bases or other acids present that might compete for it.

Q. Right. Is --

Is levulinic acid a more active or less active base than, for instance, citric acid or malic acid?

A. Levulinic acid's not a base.

Q. I'm sorry. You're right.

Is levulinic acid a more active acid than citric acid or malic acid?

MR. PLESEC: Objection.

A. I don't recall what the PKAs are of those three compounds that you suggest. I can only give you my guess, and I would say that they're similar PKAs, which would mean that they're similar acidity. Citric acid would probably have a slightly higher acidity value.

Q. Nicotine as it occurs, for instance, in the extract of G7 would occur as a salt; correct?

A. I believe that nicotine in the extract from G7

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would be present as a salt.

Q. Okay. And what salt would it be present as?

A. A mixture of many salts of a variety of acids that are naturally occurring in tobacco.

Q. Which salts?

A. Well they could be -- again a large -- there's a large number of salts. I think it's possible that nicotine could be tied up as -- I'm sorry.

There's a lot of acids in tobacco naturally. Nicotine could be tied up as salts of any or all of those.

Q. Why don't you list them for me. What's the most common nicotine salt in the G7 extract?

A. I don't know the answer to that.

Q. Have you ever looked at that?

A. I think there has been analyses of G7 extract. I don't recall the results.

Q. Okay. Would G7 contain nicotine citrate?

A. I would expect it would.

Q. Nicotine malate?

A. I would expect there would be some.

Q. What else?

A. I would expect a fair amount of nicotine acetate.

Q. What else?

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A. There's a lot of phosphates in tobacco, so I'd expect nicotine phosphate.
Q. Any others?
A. Well I think any acids that are present in tobacco could potentially form salts.
Q. What other nicotine salts would you expect in substantial amounts or significant amounts in the G7 extract?
MR. PLESEC: Objection.
A. I would be guessing. I would guess one other salt that comes immediately to mind is there's a fair amount of nitrate in tobacco. It might be possible that there would be some nicotine nitrate.
Q. Is levulinic acid more active than -- what's the acid of nitrate?
A. Nitric acid.
Q. Nitric. Is it more active than nitric acid?
MR. PLESEC: Objection.
A. By "active" you mean what?
Q. More likely to replace --
Would levulinic acid replace ni -- nitric acid in nicotine nitrate?
MR. PLESEC: Objection.
A. Without knowing -- without sitting here knowing the PKAs of the two and the PKB, I can't give you an

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exact answer. I can only guess. I would guess that nicotine would preferentially form the salt with levulinic acid.

Q. Okay. How about for nicotine phosphate? Would levulinic acid most likely replace phosphoric acid in nicotine phosphate?

MR. PLESEC: Objection.

A. Again I'm guessing. I would expect nicotine to preferentially bind with levulinic acid I think with one caveat, and that is that this is a dynamic system and I would expect nicotine in fact to disassociate and reassociate with other acids, so it's a very complex mixture.

Q. Would levulinic acid displace acetic acid in nicotine acetate?

A. I don't know. It might to a degree.

Q. Would levulinic acid displace malic acid in nicotine malate?

A. I wouldn't expect very much difference between levulinic and malic acid.

Q. Would levulinic acid replace citric acid in nicotine citrate?

A. I would expect it might to a degree. I mean, you're asking me to guess. That's what I'm doing.

Q. Let's look on the second page of the document in

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front of you, Plaintiffs' Exhibit 4811. Do you see the section where it says "Basic questions"?

A. About middle of the page I see it.

Q. Yeah. One of the basic questions is "Is nicotine addition to boost impact a legal, p.r. acceptable path?" Correct?

MR. PLESEC: Objection.

A. That's what it says.

Q. Do you know if that was ever answered?

A. As part of this project?

Q. As part of any of these nicotine manipulation projects.

A. I think we've had a number of questions about nicotine addition and whether that approach to cigarette modification is an acceptable path from a regulatory standpoint or from a PR standpoint. I'm not convinced that there's a clean answer that's been developed within Reynolds.

Q. What are the various pros and cons that have been discussed?

MR. PLESEC: Objection.

A. There's been a lot of discussions. I've only been party to some of them. Certainly the approach of making medium-nicotine/low-tar products makes sense to us as product developers. It makes sense to

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us in terms of speaking to smoking-and-health issues. It's consistent with a variety of scientists' hypotheses about approaches to -- to smoking-and-health issues.

So we've seen this as a viable approach to explore. Certainly there are -- the addition of nicotine or even the use of high-nicotine tobaccos in the last several years has become a very sensitive topic both in litigation and in the media, so again I don't think there is a -- a definitive answer to any conclusions.

Q. Are you concerned that by manipulating nicotine that it lends more credence to the claims made by the government and others that nicotine is a drug that should be regulated by the FDA?

MR. PLESEC: Objection.

A. I've said that regula --

MR. PLESEC: Excuse me one sec.

(Discussion off the stenographic record between the witness and Mr. Plesec.)

MR. O'FALLON: Let the record reflect that counsel and the witness have conferred with a question pending.

MR. PLESEC: I -- I just wanted to remind the witness that any discussions with counsel

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regarding legal issues would be privileged.

MR. O'FALLON: You could have done that on the record, sir.

MR. PLESEC: Well I just did.

MR. O'FALLON: Well there was no reason then to whisper it in his ear.

A. I'm sorry, can you ask me the question again. I've forgotten it.

Q. Was R.J. Reynolds concerned that by manipulating nicotine it would lend more credence to the claims made by the government and others that nicotine is a drug that should be regulated by the FDA?

A. Again the -- the technical --

MR. PLESEC: I object to the question. Go ahead and answer.

A. The technical approach that we've taken in the laboratory we believe is a viable approach. There are questions about the use of -- the tech -- technique of adding nicotine and how it may be perceived in the regulatory environment as well as the public relations environment.

Q. I don't think you've really answered my question, so I'm going to ask it one more time.

A. Okay. I'm sorry, I didn't understand then.

Q. Was R.J. Reynolds concerned that by manipulating

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nicotine it would lend more credence to the claim made by the government and others that nicotine is a drug that should be regulated by the FDA?

MR. PLESEC: Objection.

A. I can give you my personal opinion to try to specifically answer that.

Q. Well you've been present at meetings, so why don't you give me your opinion based on those meetings.

A. I believe that R.J. Reynolds has had as one issue in its mind on nicotine addition that that would certainly appear to be -- that -- I'm sorry, back up, strike that -- that adding nicotine to a cigarette in spite of the fact that we were doing it for legitimate scientific reasons would be perceived by regulatory authorities as nicotine manipulation and would speak to FDA concerns of drug delivery systems.

Q. And you yourself have testified that nicotine in certain forms is a drug; correct?

MR. PLESEC: Objection.

A. As -- as -- as really not an expert in this area, I've made it clear in testimony multiple occasions that I believe nicotine can be a drug under certain circumstances.

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Q. You believe that nicotine is a drug when it's in, for instance, a nicotine patch used for smoking cessation programs; correct?

MR. PLESEC: Objection.

A. Again I'm not an expert in the area of the definition of drugs, but it's my understanding that even the government's taken that position.

Q. As a matter of common sense, if nicotine in a patch, the purpose of which is to help people stop smoking, is a drug, wouldn't it also make sense that nicotine in a cigarette is a drug as well?

MR. PLESEC: Objection.

A. Up until this point -- we'll see what the future holds. Up until this point, Congress has not chosen to regulate nicotine as a drug.

Q. That's not the question I asked you, sir.

A. I know, and I'm not an expert in this area.

Q. As a matter of common sense, if nicotine is a drug when it's used in a patch, the purpose of which is to help people stop smoking, wouldn't it also be a drug when used in a cigarette, the habit which they're trying to kick?

MR. PLESEC: Objection.

A. I personally -- you're asking my personal opinion. I don't agree with that at all. I believe

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that nicotine is similar to the situation with caffeine where caffeine supplements are considered over-the-counter drugs; caffeine in coffee is not concerned -- not considered a drug or people don't worry about it being a drug.

Q. Yeah, but caffeine's not in a product that's linked with over 400,000 deaths a year; correct?

MR. PLESEC: Objection.

A. We were talking about the definition of drugs.

Q. So am I.

A. Caffeine in coffee is not considered the risk that cigarette smoking is.

Q. Was the reason that this technology was not ultimately pursued was because Reynolds was afraid that it would be regulated by the FDA?

MR. PLESEC: Objection.

A. I don't agree with that.

Q. Was that one of the reasons this technology was not pursued?

MR. PLESEC: Objection.

A. The technology or the -- the project?

Q. Either one.

A. I believe --

MR. PLESEC: Objection.

A. I believe that if we could have made consumer

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acceptable products in -- in the late '80s when the GT and XGT projects were going on, we would have commercialized them.

Q. So it's your testimony that the only reason the nicotine manipulation projects outlined here, GT and XGT, were not taken to the commercial level was because they did not produce a consumer acceptable product?

MR. PLESEC: Objection.

A. I believe that these projects were directly addressed at the -- at the Russell hypothesis approach for possible safer cigarettes. I believe that they were not implemented in the marketplace because we could not develop consumer acceptable products.

Q. So your answer to my question is that the reason the nicotine manipulation technology was not commercialized was because you could not develop consumer acceptable products?

MR. PLESEC: Objection.

A. I think I just answered it. The reason these products are not in the commercial market is because they were not consumer acceptable.

Q. In number two it talks about whether engineering can expedite nicotine recovery facility at 605. What

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is facility --
A. I'm sorry, what page are you on?
Q. I'm on the same page.
A. Number two?
Q. Yes, "Basic questions," number two on page two.
A. All right.
Q. Do you see the third line there? It states "Can Engineering expedite nicotine recovery facility at 605?" What is that? What's 605?
A. 605 is one of our plants for -- for process tobaccos. I'm just trying to read the whole section just to make sure I understand what's being said here.
Okay. What's your question?
Q. What's 605?
A. It's a -- it's a tobacco processing plant.
Q. What happens there?
A. 605, it's where -- that's one of the plants where we make reconstituted tobacco.
Q. So how were you going to recover nicotine? Were you going to take it out of the extract from G7?
MR. PLESEC: Objection.
A. I interpret this as an environmental issue because engineering -- engineering has to worry about both air and water nicotine emissions. That would be

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my interpretation of this.

Q. Well if they're looking to add nicotine to cigarettes and they're talking about nicotine recovery, that's not an environmental issue now, is it?

MR. PLESEC: Objection.

A. I disagree with that completely. If you're adding nicotine, you have the possibility of having emissions of nicotine, and if you have emissions of nicotine, you've got to control it.

Q. Did you ever institute a nicotine recovery facility at 605?

A. I'm not aware of such a thing.

Q. And at this point of course you're only doing these cigarettes in the lab, so there's no reason to have a nicotine recovery facility over at 605 at this point in the project, is there?

MR. PLESEC: Objection.

A. This work never got out of R&D.

Q. Which is why there would really be no reason to expedite a nicotine recovery facility if alls you're concerned about is environmental controls if you're adding large amounts of nicotine; right?

MR. PLESEC: Objection.

A. If the project never got out of R&D, there's no

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reason to make modifications to our manufacturing facility to recover nicotine.

Q. And the fact of the matter is at some point in time the focus of this and other projects turned to the notion of recovering nicotine from your own system and not buying it extraneously; correct?

MR. PLESEC: Objection.

A. I believe I recall in the past some discussions about using nicotine from one source as a material for use in XG- or GT-type products. That was an idea.

Q. Well you spent a lot of time and money on those types of ideas. I mean, there was one entire process that was studied for about four years to the tune of millions of dollars that was completely about recovering nicotine, wasn't it, the REST process?

MR. PLESEC: Objection.

A. The REST process was not driven by the objective, as you suggest, of recovering nicotine.

Q. It wasn't driven by the whole notion of increasing the nicotine in various of your sheets?

MR. PLESEC: Objection.

A. I don't believe that to be the primary objective.

Q. What does "REST" stand for?

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A. I'm trying to remember. Reordering of extract soluble materials or something like that.
Q. How about reestablishment of soluble materials in tobacco?
A. Sounds -- sounds fair.
Q. And soluble materials would include nicotine; correct?
A. It includes nicotine. I don't agree with your suggestion that that was the main objective of REST process at all.
Q. It really had two objectives: One was the denicotinization process, and the other was a process whereby additional nicotine was added to enhance sheet; correct?
MR. PLESEC: Objection.
A. I think the main thrust of the REST process, in my opinion, was to remove soluble material from tobacco, explore a variety of techniques of processing that extract to reduce constituents of concern, to be able to reduce nicotine, add nicotine for the purpose of XGT or GT, to do a variety of things on the extract, which then is then reapplied to the tobacco.
Q. So in other words --
A. So it was a way of addressing constituent

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issues, like problem compounds, controversial compounds. It was a way of addressing the XGT approach.

Q. It was also a way of controlling nicotine; right?

MR. PLESEC: Objection.

A. I think I've just explained what my understanding of REST was.

Q. And one of the functions of REST was to control nicotine; right?

MR. PLESEC: Objection.

A. One of the possible applications of REST was in GT- or XGT-type products, which would have been changing nicotine levels in finished products.

Q. Controlling them; correct?

MR. PLESEC: Objection.

A. I said changing nicotine levels.

MR. O'FALLON: While he's taking two seconds to review that, I have to take a quick break.

THE REPORTER: Off the record, please.

(Recess taken.)

(Plaintiffs' Exhibit 4812 was marked for identification.)

BY MR. O'FALLON:

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Q. Plaintiffs' Exhibit 4812 is a document Bates stamp numbered 50934 7328 through 7336. This concerns the REST process we've previously been talking about; correct?
A. This document does concern the REST process.
Q. Okay. And specifically it concerns authorization of spending to continue to pursue the REST process; correct?
A. I see this is authorization for capital spending to continue the REST process.
Q. On the first page in the second paragraph, it states that "The development emphasis has been expanded to include the wide range of tobacco modifications demonstrated through use of extraction-based 'REST' processing"; correct?
MR. PLESEC: Objection.
A. You read that correctly.
Q. It says "R&D requests $3,200,000 in addition to the $1,634,054 to continue engineering of the 'REST' process including the capability of providing controlled nicotine levels for products"; correct?
MR. PLESEC: Objection.
A. You read that accurately.
Q. So that's one of the purposes of the REST pro -- project, which is to achieve controlled nicotine

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levels; correct?

MR. PLESEC: Objection.

A. I would -- I would say that one of the purposes of the REST process was to alter nicotine levels.

Q. Well this uses the word "control"; right?

A. Well I tend to use "control" in a slightly different fashion.

Q. Well, how do you use "control"?

A. "Control" in terms of consistency; for example, in manufacturing we control certain var -- variables or parameters in the manufacturing process to ensure that we're making consistent products.

Q. And what the REST project was about wasn't that kind of control. It was about manipulating the nicotine; correct?

MR. PLESEC: Objection.

A. My interpretation would be that what they're implying here in the term "controlled nicotine levels" would mean, to me, altered nicotine levels.

Q. Would you agree that "altered" and "manipulate" are basically the same?

MR. PLESEC: Objection.

A. I think normally they would be. I think "manipulate" has been used in a very broad way in the tobacco issue recently.

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Q. Well it's also been used in your own documents; right?
A. Well of course there are documents that speak to that.
Q. Let's go back to Plaintiffs' Exhibit 4811 and back to the second page of that, Bates number 6905, under "Basic questions." What do they mean by "nicotine addition to boost impact"?
MR. PLESEC: Objection.
A. Well I can give you my interpretation of this.
Q. You were part of this project; right?
A. REST?
Q. This is XGT.
A. XGT? I wasn't functionally a part of this project. I had some peripheral involvement in it.
Q. Were you responsible for it?
A. No, I was not responsible for it.
Q. What did you understand your colleagues to be using when they talked about boosting impact?
MR. PLESEC: Objection.
A. I can give you my interpretation of that, and I think it is: Is nicotine addition to increase sensory impact a legal, PR or acceptable path?
Q. And that's what this whole project would be about, would be about boosting the nicotine impact;

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correct?

MR. PLESEC: Objection.

A. I think that's an oversimplification. I think my interpretation is that both the GT and XGT are both aimed at having very satisfying, very low-tar products. One of the -- one of the ways that was attempted to do that was through the addition of nicotine or nicotine salts.

Q. Because nicotine is what results in satisfaction; correct?

A. Nicotine --

MR. PLESEC: Objection.

A. Nicotine, I believe, is very important to overall satisfaction, but it's not the only factor.

Q. And when we see "satisfaction" in RJR documents, we're -- they're primarily talking about nicotine satisfaction; right?

MR. PLESEC: Objection.

A. I think that's a very broad question that is probably different from one author to another. I can only tell you what I mean by "satisfaction."

Q. Let's look on the next page, Bates number 6906, at the top. Again we were talking about the 605 plant, and this talks about engineering -- "Initiate Engineering project to condense 605 effluent and

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recover nicotine (for product use or incineration)"; correct?

MR. PLESEC: Objection.

A. That's what it says.

Q. So apparently they were talking about recovering this effluent in order to use it in a product; correct?

A. Or incineration is what it sounds like.

Q. But one of the things they were doing was talking about using your own effluent, wastewater, I take it, and recovering nicotine for that?

MR. PLESEC: Objection.

A. What it says in this sentence is it speaks to a project to look at the 605 effluent, recover nicotine either for product use or for incineration. That's the way I read it.

Q. What is 605 effluent?

A. Well I don't know exactly what 605 effluent is.

Q. Well you know what the 605 facility is; right?

A. I would -- 605 has more than -- in my es -- in my understanding, has more than just reconstituted tobacco. I think it did have the KDN plant in there, for example.

Q. And that's what this is probably talking about, right, because KDN effluent is going to have nicotine

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in it? Correct?

MR. PLESEC: Objection.

A. I would guess that this item number one on page 2a of the document speaks to, my guess, using KDN effluent for possible product use for the XG or XGT approach.

Q. In other words, using the nicotine-containing effluent from the denicotinization process to increase the nicotine of other tobaccos; correct?

MR. PLESEC: Objection.

A. Along -- I think I've made it clear, but along the lines of the XG -- I mean, I'm sorry, the GT or XGT projects and the objectives of those, one possible approach would be to use KDN effluent to increase nicotine levels to achieve those technical objectives.

Q. Number five also talks about conducting product tests to determine if tobacco extracts can be used; correct?

MR. PLESEC: Objection.

A. Well let me read the whole item number five. It says "In parallel, conduct product tests to determine if tobacco extracts with or without product configuration changes can be used to achieve the desired goals." I'm sorry, your question was what?

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Q. What tobacco extracts are they talking about there?

MR. PLESEC: Objection.

A. I really don't know. I don't remember which extracts were -- are being spoken to here.

Q. Okay. Did you generally refer to -- well there -- there's extracts being generated in a couple of processes at RJR; correct?

MR. PLESEC: Objection.

MR. O'FALLON: Do you just want a standing objection to like every question I ask?

MR. PLESEC: If you'll give it to me, that's fine.

Q. Extracts are being generated in at least two processes at RJR; correct?

A. Extracts are being generated in one process today. There is a process that we no longer employ that also generated extracts.

Q. Okay. And the processes we're talking about are the G7 process and the KDN process; correct?

A. That's correct. G7's in place. KDN has -- has been terminated.

Q. Is the G7 process a closed process; that is, is everything taken out of G7 sheet added back to that sheet?

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A. The extract that's taken out of the material that we then make a sheet is reapplied. I wouldn't call it a closed system because there are losses. There are losses to the water in -- in the water streams that are used to make the paper sheet, so the net result is there's a loss.

Q. But other than some incidental losses as a result of the manufacturing process itself, everything extracted from the tobacco bits and pieces is sprayed back on to the reconstituted sheet?

MR. PLESEC: Objection.

A. Other than losses that are normal in the processing, which does result in a reduction of -- of the tobacco solubles, the water solubles -- there's a loss. Other than that loss, which leads me to where I can't define that as a closed system, my understanding is that the material that's extracted is entirely sprayed back on the material, on --

Q. So your --

A. -- the pulp.

Q. So your answer to my question is yes; right?

MR. PLESEC: No, his answer is what he gave you.

A. I don't remember exactly your question.

Q. Well --

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A. I'm just trying to phrase my own answer.
Q. It's sometimes helpful to remember the question in order to answer it, so let me read it back.
But other than some incidental losses as a result of the manufacturing process itself, everything extracted from the tobacco bits and pieces is sprayed back on to the reconstituted sheet?
A. I believe that the material that's extracted is sprayed back on.
Q. On the next page it appears that when Reynolds produced this document, they produced it out of order, but it's Bates number 6907.
A. The page numbers are out of order. Is that what you're referring to?
Q. Right.
A. Yeah.
Q. Under Roman numeral IV it talks about using nicotine in Freon to puff tobacco. Was that ever done?
A. I think it's one of those ideas that never saw the light of day.
Q. Was it even done experimentally?
A. I'm not aware that there was ever an experiment done to incorporate nicotine in Freon.
Q. Okay. Under Roman numeral V it says "Apply

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nicotine in G7" formulation -- or "formation, add levulinic acid," and then it says "determine boost from" alternative "extract application."

How do you determine the boost?

MR. PLESEC: Objection.

A. Well it depends on how the author intended or defines "boost." It could be an analytical measure of increased in -- increase in nicotine. It could be a sensory measure of increased sensory response in a -- for a smoker, so I don't know.

Q. Well if the boost is to increase nicotine, it would also make sense that any -- any sensory difference would also be due to nicotine; correct?

MR. PLESEC: Objection.

A. I think if -- if one holds everything else the same and increases the nicotine, the overall sensory response would be increased.

(Plaintiffs' Exhibit 4813 was marked for identification.)

BY MR. O'FALLON:

Q. Plaintiffs' 4813 is a document Bates stamp numbered 50885 6730 through 6735. This is a memo dated July 14th of 1988; correct?

A. This is a memo that is dated July the 14th, 1998.

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Q. 1988.
A. I'm sorry, 1988. Apologize.
Q. And it's from Robert Powell, Jerry Redding and Cynthia Stewart; correct?
A. I believe that's what it says, yes.
Q. Those are R.J. Reynolds employees?
A. All three are R.J. Reynolds employees.
Q. In what department at this time?
A. They're --
MR. PLESEC: Today or then?
MR. O'FALLON: Then.
A. They were employees of R -- R&D.
Q. And this is about the XGT file; correct?
A. The title is "XGT File." Or I'm sorry, the addressee is "TO: XGT File."
Q. Okay. And the objective is "To determine" the "nicotine delivery in the mainstream smoke of" in -- "individual tobacco types to which nicotine levulinate prepared from tobacco essence plus levulinic acid has been" prepared; correct?
MR. PLESEC: Objection.
A. You read that accurately except for the last. It's "added," not "prepared."
Q. Oh, it's been added. You're right.
What's tobacco essence?

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A. Well, my interpretation is tobacco essence would be tobacco extract.
Q. Okay. So they're basically taking the tobacco extract and they're adding levulinic acid to this soup; right?
A. I think that would be my general overall conclusion from this.
Q. As a matter of fact, it says that "A previous memo ... by the above authors contained the experimental design of this project, the procedure for preparing the tobacco essence plus levulinic acid 'soup' and the results of 'soup' addition to individual tobacco types in SALEM KS configuration"; correct?
MR. PLESEC: Objection.
A. You read that right.
Q. And they're saying now the soup has been added to the same tobaccos -- and then they give the various configurations -- and to a blend; right?
MR. PLESEC: Objection.
A. Overall that's correct. These are not configurations. These are tobacco types, though.
Q. And they're apparently the tobacco types that make up the commercial Vantage Ultra Light configuration?

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MR. PLESEC: Objection.
A. I would say that these are the tobacco types that are used in Salem King Size configuration. I'm sorry, my mistake.
Q. The Vantage Ultra Light configuration; right?
A. I would say these would be major components of the Vantage Ultra Light configuration.
Q. Which is why the subject matter up above says "Nicotine Levulinate, VUL 85." That's Van -- Vantage Ultra Light 85s; correct?
A. V --
MR. PLESEC: Objection.
A. "VUL" relates to or speaks to Vantage Ultra Light 85 cigarette.
Q. Okay. And what this basically shows is that as you add nicotine levulinate, the tar-to-nicotine ratio decreases; right?
MR. PLESEC: Objection.
A. If you will, just give me a minute to look at it.
(Witness reviews Plaintiffs' Exhibit 4813.)
Q. It might be easier to refer to the charts. There's one on 6732.
A. Yes, I see that. I don't understand the table

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on 6731, though.

Q. Well the table on 6731 is simply showing that as you increase the amount of nicotine levulinate added, you also increase things like nicotine and the tar-to-nicotine ratio -- and -- you increase the level of nicotine and you decrease the tar-to-nicotine ratio; right?

MR. PLESEC: Objection.

A. But what I don't understand is it's talking about injected. I mean, it -- in the title it speaks to soup and then in the heading it speaks to injected. I -- I mean, I just don't understand that experiment, but it seems like the Table 2 may -- well, I guess I'm not -- I'm not sure that -- you know, exactly how this experiment was conducted, but if you want to turn to the charts, that would be fine.

Q. The chart on page 6732 indicates that as more nicotine levulinate is added, the tar-to-nicotine ratios generally trend downward; correct?

MR. PLESEC: Objection.

A. I think that's a fair description of this chart.

Q. And then if you look on the chart on page 6734, which is entitled at the top "GRAPH 2," it indicates

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that as the soup from nicotine levulinate is increased, so is the smoke nicotine increased, correct -- so does the smoke nicotine increase?

MR. PLESEC: Objection.

A. Let's see. The vertical axis is increase in smoke nicotine.

Q. Right.

A. So that would be the change in nicotine, I suppose, in the smoke versus added nicotine on the horizontal axis, and it goes up with -- all right. So the change in smoke goes up with increased added nicotine.

Q. Right. So in other words, the more soup nicotine levulinate you add, the more smoke nicotine you deliver; correct?

A. I think that's --

MR. PLESEC: Objection.

A. -- that's a fair description of this graph.

(Plaintiffs' Exhibit 4814 was marked for identification.)

BY MR. O'FALLON:

Q. Plaintiffs' Exhibit 4814 is a document Bates stamp numbered 51150 3434 through 3478. This is entitled at the front "PROJECT XGT"; correct?

A. The title on the front page of this document is

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"PROJECT XGT," that's correct.

Q. Let's look at the second page, Bates number 3435. It states at the top "XGT RATIONALE"; correct?

A. Correct.

Q. One, it states "PRIOR WORK WITH NICOTINE LEVULINATE DEMONSTRATED THAT LOW TAR-TO-NICOTINE RATIOS COULD BE ACHIEVED WITHOUT UNDUE HARSHNESS"; correct?

MR. PLESEC: Objection.

A. Yeah, you read that correctly.

Q. So apparently upon smoke tests, you found that smokers did not find these products to be unduly harsh; correct?

MR. PLESEC: Objection.

A. That's what this statement says.

Q. It then goes on in number two and says that "ANY FURTHER DEVELOPMENTAL WORK REQUIRED THAT NICOTINE BE TOBACCO-SOURCED; I.E. HIGH NICOTINE TOBACCOS OR TOBACCO EXTRACTS"; correct?

MR. PLESEC: Objection.

A. That's what number two says.

Q. The 1988 objectives were to "IDENTIFY A TOBACCO-BASED SOURCE OF NICOTINE FOR FURTHER DEVELOPMENT OF PRODUCTS WITH XGT TECHNOLOGY";

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correct?

MR. PLESEC: Objection.

A. You read that right.

Q. Second bullet point is to "IDENTIFY MEANS TO FORTIFY THE FLAVOR OF PRODUCTS DEVELOPED WITH XGT TECHNOLOGY"; correct?

MR. PLESEC: Objection.

A. You read that right.

Q. Third bullet is to "DEVELOP SAFE AND EFFECTIVE MEANS FOR INCORPORATION OF TOBACCO-BASED NICOTINE INTO PRODUCTS"; correct?

MR. PLESEC: Objection.

A. You read that correctly.

Q. And the fourth is to "OPTIMIZE NICOTINE DELIVERIES WHILE CONTROLLING TAR DELIVERIES SO THAT TECHNOLOGY ADVANCEMENT COULD BE USED FOR 1989 PRODUCT DEVELOPMENT"; correct?

A. You --

MR. PLESEC: Objection.

A. -- read that correctly.

Q. Let's look at page 51150 3437. This refers to an "XGT NICOTINE TRANSFER STUDY"; correct?

A. That's what it says.

Q. The objective was "TO UNDERSTAND NICOTINE DELIVERY FROM TOBACCO"; correct?

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A. That's also what it says.
Q. On the next page under "SUMMARY," the first bullet point is "A unique tobacco essence to add flavor and nicotine to tobacco"; correct?
MR. PLESEC: Objection.
A. That's what it says.
Q. The second is "The use of selected additives to change the smoke pH index"?
MR. PLESEC: Objection.
A. You read that right.
Q. The next bullet is the "percent nicotine transfer is constant for a specific tobacco type and cigarette configuration"; correct?
MR. PLESEC: Objection.
A. You read that correctly.
Q. And the final is "Reduction of tar to nicotine by the addition of nicotine levulinate or tobacco essence (with minimal increases in CO or tar)"; correct?
MR. PLESEC: Objection.
A. You read that correctly.
Q. So pH is still something that's being considered as part of your design parameters for this particular project; correct?
MR. PLESEC: Objection.

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A. Well I'm not sure of the details of that second bullet point. We've had various researchers at different points look at pH and measure pH from different prototypes for different reasons.
Q. Okay. Let's look on --
A. I'm not sure what's behind that.
Q. Let's look on page 3440.
A. Sure.
Q. This is entitled a "SUMMARY"; correct?
A. That's right.
Q. It says "FOUR TECHNIQUES WERE CONSIDERED FOR INCORPORATION OF ESSENCE AND" ALTERNATIVE "FILLERS"; correct?
MR. PLESEC: Objection.
A. That's right.
Q. "FURTHER WORK REQUIRED IN THE AREAS OF ACTIVATED CARBON AND THE G-7 PROCESS"; correct?
MR. PLESEC: Objection.
A. That's what it says.
Q. Then it talks about "DRS: EXPENSIVE PROCESS; NO NICOTINE LOSS." What is DRS?
A. Dried reconstituted sheet.
Q. Was that ever done?
A. We had an exploratory project looking at DRS because we thought there would be economic advantages

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to it. It didn't pan out, not implemented.
Q. The entire reconstituted tobacco process is basically a cost-saving process; right?
MR. PLESEC: Objection.
A. Well it certainly started out as -- as a cost-savings process. I think that is a major reason it's in use today. It did turn out of course to be one element in the tar reduction program.
Q. Or as we've discussed, non-tar reduction, depending on whether you believe nicotine compensation or not.
MR. PLESEC: Objection.
A. The G7 reconstituted sheet was developed for economic reasons. It did turn out to have an effect on the overall tar yield reduction.
Q. And when you say "overall tar yield reduction," you're simply referring to overall tar yield reduction as measured by FTC numbers, which don't encapsulate how any given smoker smokes a cigarette; correct?
MR. PLESEC: Objection.
A. I'm referring to overall tar reduction as measured by standard laboratory methodology.
Q. As measured by the FTC; correct?
A. Well in particular the FTC test method.

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Q. Number four talks about the cast sheet line. What's that?
A. Oh, we've had an experimental reconstituted sheet project looking at a cast sheet as opposed to a paper sheet.
Q. The cast sheet is the process used by Philip Morris; correct?
MR. PLESEC: Objection.
A. Philip Morris has used a cast sheet process in the past. I don't think that the -- the cast sheet lines that we've developed are exactly like Philip Morris's, but we've looked at a variety of different types of cast sheets and cast sheet formulations.
Q. Let's look at page 3441.
A. Okay.
Q. This is an "XGT CASING STUDY"; correct?
A. That's what it says.
Q. Let's look at the summary on page 3442. It was found that total casing was --
A. I'm -- I'm sorry, I was back on 3441. Okay. I'm sorry. Now I'm with you.
Q. 3442, the summary under number one says "FOUND THAT TOTAL CASING WAS MORE ACCEPTABLE THAN BURLEY CASING AS A CARRIER FOR THE TOBACCO DERIVED NICOTINE"; correct?

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MR. PLESEC: Objection.

A. That's what it says.

Q. Was tobacco-derived nicotine ever added to the casing?

MR. PLESEC: Objection.

A. In experimental prototypes, I believe that we did use casing as a carrier for tobacco extracts.

Q. Has tobacco extract ever been added to casing in a commercial product?

MR. PLESEC: Objection.

A. Not to my knowledge. I don't believe so.

Q. But you're not certain?

A. I will be very certain. We have not added nicotine to commercial products.

Q. I'm specifically adding about the casing.

A. We have not added nicotine to commercial products via casing or any other vehicle.

Q. Two says "FOUND THAT DOUBLE CASING GAVE MORE EVEN DISTRIBUTION OF DOUBLE CASING AND TOBACCO DERIVED NICOTINE"; correct?

MR. PLESEC: Objection.

A. That's -- you read that correctly.

Q. Three was "FOUND THAT ... LOSSES OF NICOTINE FROM CASING DURING PROCESSING WAS MINIMAL"; correct?

MR. PLESEC: Objection.

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A. That's what it says.
Q. What processing are they talking about?
MR. PLESEC: Objection.
A. I would suppose from just the casing operation and the drying.
Q. Did you do this in your commercial process? This doesn't appear to be -- if you're worried about or if you're talking about processing, presumably this was done as some kind of a run through your manufacturing facility?
MR. PLESEC: Objection.
A. No, we have a pilot plant that we do experimental work in.
Q. Okay. And that's what you think this was?
MR. PLESEC: Objection.
A. That would be my guess.
MR. O'FALLON: What's -- you have now objected to every single question I've asked. What's the basis of your objection?
MR. PLESEC: Well you're assuming a lot of facts that aren't in evidence.
MR. O'FALLON: I'm asking questions, sir.
MR. PLESEC: Okay. Just go ahead. You know, my objections are noted. The judge will rule on them down the road. If -- if they're well taken,

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he'll -- he'll agree. If they're not well taken, he'll overrule me.

MR. O'FALLON: Is there any question that you -- that I ask that you won't object to, because, I mean, if you're just going to object to every question, I will give you your standing objection?

MR. PLESEC: Well then I'll take it.

MR. O'FALLON: Great.

BY MR. O'FALLON:

Q. Number four is "ACHIEVED A RANGE OF TAR-TO-NICOTINE RATIOS FROM 12.25 TO 5.4 USING TOBACCO" -- "TOBACCO DERIVED NICOTINE BLEND AND DOUBLE CASING ADDITION"; correct?

A. You read that right.

Q. Let's look on page 3449.

A. This entire document appears to be slides from a presentation. Do you agree?

Q. You know, I don't work at R.J. Reynolds, so I'm not really sure, but if that's what you believe it to be, then certainly you would know.

A. No, I'm just trying to get a sense of this document. That's all.

Q. Is that what you think it is?

A. That's what I'd have guessed it is, yes.

Q. Okay. Do you recall whether you saw this

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presentation?
A. I think I've seen bits and pieces of this in different ways. I don't recall this particular document or this particular presentation.
Q. Were there presentations given on a regular basis to kind of update the group or all the people working on a particular project either intensely or peripherally on what the status of that project was?
A. We have project updates often. They're -- they're not -- we don't have rigid schedules and rigid approaches to project updates. It depends on the project leader as well as management's desire for project updates.
Q. Would that have been the context for these slides to be shown, in some kind of a project update, based on what you can see from the document?
A. Well I'd only be guessing. My guess would be that this would be an overall project update for XGT that might have been given in R&D or to management.
Q. Okay.
A. I don't know.
Q. Let's look on page 3449.
A. All right.
Q. Number five is talking about a focus group Delta. Are you familiar with that term?

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A. Under number five?
Q. Yes.
A. Delta, yes, I'm -- I'm familiar with Delta --
Q. Is that a --
A. -- a -- a little bit.
Q. -- certain type of a consumer test that's run?
A. Well it's -- it's not a quantitative consumer test. In fact it's a -- it's a focus group, which is a qualitative consumer evaluation.
Q. So in other words, you gather up a certain amount of people and have them smoke the product and give you their impressions?
A. We generally in focus group work will collect 8 to 12 people in a room at one time, have them evaluate products and in discussion groups get their feedback on those products.
Q. Okay. And that's --
And this appears to be reporting the results of a focus group on the XGT product; correct?
A. This appears to be an overall summary of some Delta focus group on some products.
Q. Presumably XGT products; right?
A. Well it's under the heading "XGT." I would presume that it's related to XGT.
Q. And this indicates that the products were

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perceived to be fairly smooth with a light smoke, similar in taste to Marlboro Lights or Benson & Hedges 100, interest shown; correct?

A. That's what it says.

Q. So apparently the consumer acceptance of this particular product was okay at this point in time?

A. That would -- that would be my overall assumption. I don't know which product we're referring to here, though.

Q. Let's look on page 3456, "TOBACCO EXTRACTS." This is talking about apparently four different types of tobacco extracts.

A. That's what it appears to be.

Q. The first one is "Spray-dried tobacco extracts." Do you know how that was arrived at?

A. I don't understand "how that was arrived at."

Q. I'm sorry. What is that?

A. It's a tobacco -- well my understanding is spray-dried tobacco extracts is a tobacco extract that is spray dried to remove the water and other volatiles.

Q. Do you know where that extract was taken from?

A. For XGT?

Q. Yeah.

A. No, I don't.

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Q. And then it says "Commercial tobacco oleoresins." What are those?
A. Oleoresins, I'm not entirely sure.
Q. Okay. What are supercritical carbon dioxide extracts?
A. It's possible to extract tobacco with a supercritical CO2 process. R.J. Reynolds has done that on a very small scale in the laboratory.
Q. And four, "Tobacco essences," do you know what they're talking about there?
A. Well not -- not specifically. I -- I assume in a general sense tobacco essence is some water extract of tobacco.
Q. Why don't you look on the next page; this is page 3457. This is a smoke pH index of Vantage Ultra Light 85s; correct?
A. That's the title, that's right.
Q. And apparently what they're talking about here is free base nicotine; correct?
A. Well I'm trying to understand what they are talking about. What they have in the vertical axis is measured smoke pH. I would assume that it's measured. And then on the horizontal axis they have theoretical parts per million injected and then I assume four different materials that are injected.

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So you're comparing -- they were comparing four different materials injected into cigarettes and determining the smoke pH. That would be my take on it.

Q. And they titled it "FREEBASE NICOTINE"; correct?

A. I don't understand that frankly.

Q. Well what they're really reflecting is that pH is really a measure of free base nicotine in the smoke; correct?

A. Well we've already talked about pH's relationship to volatile or free nicotine. I don't understand what it's trying to -- to say here in -- in this chart because underneath the words "FREEBASE NICOTINE" in parentheses is "(MIN MINUS MAX SMOKE pH INDEX VALUES)," so I don't understand that. But I do see this plot is a plot of changes in pH as -- if I assume the experiment's done as I assume, as each of four different materials were injected into cigarettes.

Q. Well it appears that at least some of your colleagues believe that pH is a indicator of free base nicotine; correct?

A. I think you're misunderstanding what I said this morning when -- when we talked about pH and free

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nicotine. I told you theoretically if one increases pH, one ought to increase free nicotine. We -- we -- we didn't seem to understand -- or you didn't seem to understand my testimony, though, about being able to calculate free base nicotine or free nicotine or, you know, and we got into a number of -- of -- of other points.

Q. Or --

A. But I never said that there wasn't a relationship between the two. I do believe that there should be a relationship between the two.

Q. Well apparently some of your colleagues need as much education as I do, huh?

A. I don't understand that question.

Q. Did you ever go tell the people working on this project that, "Doggone it, you can't measure free base nicotine, so you shouldn't be putting it in documents"?

A. We've had a number of discussions over the years going back to as long as I can remember about what pH measures mean on cigarette smoke. It's -- there's been ongoing informal discussions as long as I can remember.

Q. My question was: Did you ever go tell the people working on this project that, "Hey, you can't

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measure free base nicotine, so you shouldn't be putting it in documents"?

A. I don't remember saying that.

(Plaintiffs' Exhibit 4815 was marked for identification.)

BY MR. O'FALLON:

Q. Plaintiffs' Exhibit 4815 is a document Bates stamp numbered 50646 2459 through 2460. Have you seen this document previously?

A. It looks vaguely familiar. I can't recall seeing it.

Q. This is again another report on XGT; correct?

A. It seems to be, yes.

Q. The technology is the "Nicotine Salts/Tobacco Extracts"; correct?

A. Under the section "TECHNOLOGIES," it has "Nicotine Salts/Tobacco Extracts."

Q. And under "STATUS" it states "Biobehavioral Testing of 2 milligram 'tar' products with L-nicotine levulinate applied"; correct?

A. Yes.

Q. Let's look at the next page. Under "STATUS" it states that "The 2 milligram test product transferred 30 to 50 percent more nicotine into plasma of" a "full-flavor/low-tar smoker than is normally

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transferred by WINSTON KS to a WINSTON KS smoker"; correct?
A. That's what it says.
Q. What's the importance of that?
A. Well I don't know what you mean by "importance." I can tell you my interpretation of it.
The 2-milligram product with added nicotine delivered more nicotine to the smoker.
Q. So you're delivering more nicotine into the blood of a smoker; correct?
A. That's what that seems to say, which would fly in -- in the face of your idea of a hundred percent compensation, wouldn't it?
Q. We're talking apples and oranges, sir, aren't we?
A. You brought it up earlier today.
Q. This is talking about how much nicotine that you're delivering from this --
A. If there were a hundred percent -- if there were a hundred percent compensation, then everybody would have the same blood nicotine level, wouldn't they?
Q. Well do you know how this was -- do you know how this was tested or --
A. All I'm giving you is my interpretation of

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what's said here. I know in a general sense how we measure plasma nicotine levels.

Q. So this apparently would give the boost in the bloodstream that you would want; correct?

A. My interpretation of this again is that this 2-milligram test product that has added nicotine in fact delivered more nicotine to the smoker --

Q. Than is transferred --

A. -- compared -- compared to the control Winston product.

Q. And to a Winston KS smoker; right?

A. It's -- yeah, it specifically speaks to Winston King Size control product smoked by a Winston King Size smoker would be my interpretation.

Q. And is that what your goal was, to increase the amount of nicotine that was in the plasma of smokers?

A. The goal of XGT overall was to develop products that had much lower tar levels but maintained consumer acceptance, and the idea was that those products might be a safer cigarette.

Q. Because it would alter the tar-to-nicotine ratio; correct?

A. Because it would reduce the overall exposure to tar.

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Q. It would reduce the tar-to-nicotine ratio; correct?
A. That was one way of doing it, changing the tar-to-nicotine ratio, maintain consumer acceptability and reduce the consumer's overall exposure to tar.
Q. Now you said it was thought to be a safer cigarette.
A. I don't recall exactly what I said. I'll tell you what I think.
Q. Well why don't we go back and recall exactly what you said.
A. Thank you.
Q. You said, "The idea was that those products might be a safer cigarette"; correct?
A. Overall reduction in exposure, I think most toxicologists or biologists would agree that reduced exposure ought to be safer.
Q. Well in order to have a safer cigarette, you have to have an unsafe cigarette; right?
A. Cigarettes -- cigarettes are certainly a risk for a number of diseases. We talked about that yesterday. A lot of what we've been trying to do at Reynolds and a large part of my effort at Reynolds over 20 years has been to try to reduce the risks of

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smoking through product design. XGT was one project that spoke to that.

Q. Do you agree that in order to have a safer cigarette, you have to first have an unsafe cigarette?

A. I don't know what you mean by the relative term "safe" and "unsafe." I've made it clear that I believe cigarettes are risky, that they're a risk for a number of chronic diseases. If you want to interpret that as unsafe, that's fine. That's -- that's a general term.

Q. You used the word "safe." What do you mean by "safe"?

A. I used the term "safer."

Q. Okay. What do you mean by "safer"?

A. What I mean is reduced risk of -- reduced risk or risk potential of -- of -- of developing disease. If cigarettes are a risk for smokers developing certain diseases, then my goal and I think Reynolds' goal has been to reduce the risks of smoking. It's a comparative term.

Q. But Reynolds has never undertaken to study the first part of that equation, whether cigarettes are a risk for smokers developing certain diseases; correct?

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A. I don't agree with that at all. We've studied the literature. We have -- we've contracted experiments and -- and research in universities. We've done our own biological testing. We've done our own biological research. We've developed cooperative relationships with top scientists around the world who are experts in -- in biology and toxicology, so I -- I don't think that's a fair statement.

Q. What conclusions have you drawn from all of the research you just outline -- outlined about what causes the risk in cigarettes?

A. Why cigarettes are a risk?

Q. No. Listen to my question. What conclusions have you drawn from all the research you have just outlined about what causes the risk in cigarettes?

A. I don't know. I'm not an expert in the area.

Q. Well you've been willing to testify as to all the various research you've done. What conclusions have you drawn from all of that research concerning what causes the risk of cigarettes?

MR. PLESEC: He just asked -- that was asked and answered.

A. In my testimony I speak to a number of smoke constituents as constituents of concern. We've tried

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to reduce or eliminate those. We've had some success. We've had a major overall success in general tar reduction. We talked about that yesterday.

I think overall exposure reduction is a reasonable direction to take, and that in fact was the overall point of the XGT, the XG -- the GT projects as well.

Q. My question is: What conclusions have you at R.J. Reynolds drawn from all of the research that you've outlined above concerning what causes the risk of cigarettes?

A. You're asking a question that is extremely complicated and is really not in my area. I can tell you that there are a number of constituents in cigarette smoke that are thought to be a potential problem.

Q. I'm not ask --

A. We've looked at those. We've looked at -- at a number of things. We measure chemistry in modified products to see how we can influence, how we might change the risks of smoking. We measure biology -- biological endpoints to see if we have any chance of changing the risks of smoking.

I don't understand your question and how it

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applies -- or how I can -- can answer it any further.

Q. What conclusions have you drawn from all of your research that you outlined above concerning what it is in a cigarette that causes the risk associated with cigarettes?

MR. PLESEC: Dan, you've asked that three or four times now and he's given you an answer.

MR. O'FALLON: I'm going to answer -- I'm going to ask it until I get an answer.

MR. PLESEC: He has given you three answers to three questions --

MR. O'FALLON: Yeah, but --

MR. PLESEC: -- and it's the same answer.

MR. O'FALLON: -- but he hasn't given me -- he hasn't given me an answer to the question I've asked.

A. Okay. Then bear with me and let me ask you some clarifying questions. When --

Q. I ask the questions here. Can you answer my question or not?

MR. PLESEC: Well he's trying to understand what your question is.

A. I've tried, Dan.

MR. PLESEC: He's responded three times.

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Q. If your -- if your answer is that you don't understand my question, then you can state that. I'm going to do -- I'm going to say it again.

What conclusions have you drawn from all of the research you outlined above concerning what substances in cigarettes cause the risk of cigarettes?

A. Beyond the answer I've already given you, I don't understand your question. There's nothing further I can add.

Q. If you haven't identified the constituents in smoke that cause disease, it's pretty difficult to know what to remove; correct?

A. We've looked at the constituents that people in the scientific community have considered the potential problems to the risks of smoking.

Q. People --

A. No --

MR. PLESEC: He hasn't finished his --

THE WITNESS: Yes, I answered.

MR. PLESEC: Or you have. Okay.

Q. People in the scientific community don't make $1.4 billion a year selling cigarettes, do they, sir, in profit?

A. People in the scientific community don't sell

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cigarettes.

Q. And so people in the scientific community haven't made $1.4 billion in one given year selling cigarettes, have they?

A. I think that's obvious.

Q. R.J. Reynolds has made $1.4 billion what, last year in profit from the sale of cigarettes?

A. That's our approximate operating company contribution last year.

Q. R.J. Reynolds took an oath to the people of this country back in 1953 that they would put the health of cigarette smokers above all others; correct?

A. That's a paraphrase.

Q. You're right, that is. Is it an accurate paraphrase?

A. If you're referring to the statement in the Frank Statement, we talked about that yesterday. I'm not sure of the circumstances around that. I'm interpreting it, just as you are, in 1997 trying to look at what's said in 1994 or '93 or whenever that was.

Q. Don't you think it's --

A. I don't -- go ahead.

Q. Don't you think it's incumbent upon any company that makes $1.4 billion a year in profits selling a

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product to make sure that that product is safe?
A. I'm telling you as a long-term employee of R.J. Reynolds we have taken seriously the smoking-and-health issue, and we've done an awful lot trying to reduce the risks of smoking. Cigarette smoking is a clear risk. What we've tried to do is reduce the risks. I'm not convinced that there will ever be a cigarette without any risks. There may be. I'd love to see it.

But we -- our job is to try to reduce the risks, and that's what we've tried through research and development, through contract research and through widespread scientific involvement around the world to accomplish, and I resent the notion that we've sat back and not tried to reduce the risk because I've spent most of my career trying to do that. Many scientists at Reynolds have spent their careers trying to do that, and we've had some success.
Q. And the fact of the matter is that if a smoker smokes to get a certain level of nicotine, that those smokers receive the same amount of tar from the cigarettes on the market today as they did back in 1950; isn't that true, sir?
A. You're making again the incorrect assumption that people smoke to 100 percent compensation to

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always get the same level of nicotine. I don't agree with that assumption.

Q. But apparently people inside your own organization do agree with that, and the most recent tests done by RJR would in fact support the notion that people do 100 percent compensate for their cigarettes; correct?

A. I don't -- that's not my testimony as to the interpretation of any of that kind of research at Reynolds. We talked about a number of -- we -- we talked about two major studies that were conducted recently that had different answers, different results. We talked about a summary of the literature that -- that con -- that concluded that compensation occurs. Of course it occurs, and it occurs maybe over eight experiments roughly --

Q. Selectively picked.

A. -- to a 50 percent -- I beg your pardon. I don't believe our scientists selectively picked stuff, and I resent the hell out of that.

Q. They didn't --

They didn't look at all of them, did they?

A. Look, if you want my opinion, then listen to me and quit interrupting me with -- with snide comments like that. I'm -- I'm here to answer your

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questions.
Q. Good.
A. I'm here to try to be honest. I am honest. I'm trying to be accurate. If you want to know my opinion, ask me a question; I'll answer it.
Q. Okay. What studies have you done at R.J. Reynolds to identify the constituents of smoke that cause disease?
A. What biological experiments have we done to try to identify constituents that cause disease?
Q. Absolutely.
A. We do not have the capability at Reynolds to do basic medical research in a large fashion. We do biological research as best we can. We're not experts in medical research. We have some scientists who are highly skilled and highly knowledgable and probably are, but we don't have laboratories that are world class in medical research.

We do undertake basic biological research, as I talked yesterday about, for example, looking at DNA adduct formation and how it may be involved in -- in tumor initiation, and we try to understand as much as we can in our laboratory.
Q. A --
A. Beyond that, we do contract research outside and

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we -- we try to work with and discuss with experts around the world.

Q. A company that makes in any one given year $1.4 billion in profit could certainly spend the money, if it so chose, to develop laboratories to do biological research; isn't that true, sir?

A. If we did biological research, would anybody believe it?

Q. Would you answer my question.

A. I'm give -- all right. What's your question?

Q. A company that makes in any one given year $1.4 billion in profit could certainly spend the money, if it so chose, to develop laboratories to do biological research; isn't that correct?

A. It is possible for us to establish basic medical research into causation. We, however, are not experts in the field and we've turned to experts who are at universities and at contract labs.

Q. So your answer to my question is yes, if you chose to build those biological laboratories, you could have certainly done so?

A. Technically we could build laboratories and conduct basic medical research into causation. We do conduct some research trying to understand mechanisms of disease. We, however, contract research outside

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the company with experts around the world.

Q. In fact, for approximately three years, from approximately 1967 to 1970, when you abruptly shut the program down, Reynolds did have biological research facilities in which they conducted, among other experiments, inhalation experiments with animals; correct?

A. My understanding is we had a biological research division in the '60s, that it was -- that that group was terminated in roughly '70 or '71, thereabouts. I don't know the details. That that laboratory did conduct biological research and biological testing. I believe our present biological testing laboratories and scientists are outstanding, and we do quite a lot of animal tests as well as in -- in vitro tests.

Q. I'm going to move to strike everything after "I believe."

At some point the XGT project was moved to the flavor division; is that true?

A. No, that's not true. I don't -- I don't think that's true at all.

(Plaintiffs' Exhibit 4816 was marked for identification.)

BY MR. O'FALLON:

Q. Plaintiffs' 4816 is a document Bates stamp

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numbered 50893 5926 through 5938, and I would ask you specifically to look at 5931.

Are you on page 5931?

A. I'm almost there. I'm just trying to get a sense of what this document is.

Q. This is a document I predesignated. Did you have a chance to review these predesignated documents prior to this deposition?

A. I've reviewed some predesignated documents. I don't recall this one.

Okay.

Q. Could you look at 5931.

A. I am on 5931.

Q. The second bullet point says "Projects XGT and GTX shifted to Flavor Division"; right?

A. That's what it says. That wouldn't be my interpretation.

Q. You have another interpretation of that fairly point-blank statement?

A. My interpretation is that XGT and GTX were product development projects. I believe we ran into consumer acceptance issues. I believe that the future of those fell on the flavor division's shoulders. I don't recall all of a sudden XGT becoming a flavor division-only project. It was

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always a product development project.
Q. So is it your testimony that when it says "Projects XGT and GTX shifted to Flavor Division," that that's wrong?
A. I'm giving you my interpretation of what it says here based on what I know about the projects. That's all.
Q. And your interpretation is that this statement is wrong?
A. I am giving you my interpretation to this. It depends on how one interprets this when they read -- when they've written it. I don't know what the author meant when they wrote it. I can tell you my interpretation of the events; that is, that XGT was a product development project, that GTX was a product development project and always was such. We ran into problems in developing consumer acceptable products with those -- on those projects, and it fell on the flavor division's shoulders to try to figure out if there was a way around those problems.
I don't recall that those projects ever became solely flavor division projects. It seems to me we're quibbling about interpretation. I just told you how I would interpret what is said here.
Q. You're saying this document's wrong?

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A. I think I've just answered that. I gave you my interpretation based on my experience. I think it depends on what was in the author's mind when they wrote this down. I can't read that -- their mind. I don't even know who wrote this document.

Q. Well presumably you deal with documents every day where you don't know what's in the author's mind and you have to rely on what they say. You find that to be an unclear, misconstrued notion as you understand the project?

A. I think it's unclear in that your interpretation had been that the project itself -- my interpretation of your question -- I may be wrong, but my interpretation of how you asked me the question was that Project XGT and GTX became flavor division projects. That's not my -- that's not my opinion at all.

Q. Did Projects XGT and GTX continue to be pursued in the flavor division?

A. I believe members of the flavor division for quite some time tried to develop flavor formulations that would overcome the problems of XGT and GTX.

Q. Is nicotine levulinate added to any of the flavor formulations of commercial cigarettes?

A. No.

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Source: https://www.industrydocuments.ucsf.edu/docs/qfhd0001

Q. Levulinic acid is, though, isn't it?
A. Levulinic acid? I don't know all of the additive formulations, the flavor formulations, but I believe levulinic acid at extremely low levels is in some of our flavor packages.
Q. And even at extremely low levels, levulinic acid increases the effect that nicotine has on the body; correct?
A. I don't know that at all.
Q. Why don't you look -- why don't you go back to the first page of this document. This document is entitled a review -- "Review the use of organic acids and nicotine salts in tobacco burning cigarettes, and recent attempts to develop an ultra-low 'tar' cigarette with enhanced nicotine yield"; correct?
A. You've read that correctly.
Q. So apparently this is some kind of a review document; correct?
A. That would be my assumption.
Q. Look on page 5928.
A. Okay.
Q. Do you see up above where it says about "In an attempt to improve 'impact' and tobacco taste, Project GT explored the addition of Nicotine Levulinate (salt form) to 2 ultralow cigarettes, NOW

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and WINSTON ULTRA LIGHT 100s"?

A. That's what it says.

Q. Do you see at the bottom where it talks about binding studies?

A. I see where it says "Binding studies."

Q. It says "Within a narrow concentration range, addition of nicotine levulinate seems to enhance the binding of nicotine to receptors"; correct?

A. That's what it says.

Q. Do you understand what that means?

A. No, I don't.

Q. Let's go back to the page 5931 where it talks about "Projects XGT and GTX shifted to Flavor Division."

A. Okay. I'm on 5931.

Q. Do you see under there where it talks about task?

A. The bullet below the one we referred to says "Task."

Q. It says "Explore" alternative "methods/sources for enhancing nicotine yields of low 'tar' products"; right?

A. That's what it says.

Q. Was it your understanding that that new research was done in the flavor division?

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Source: https://www.industrydocuments.ucsf.edu/docs/qfhd0001

A. You know, no, it wasn't my understanding that that was solely flavor division work. The use of tobacco extracts, the use of alternate fillers, for example, as -- as spoken to in this document, were not necessarily solely the flavor division's charge.

Q. Whether it was solely the flavor division's charge or not, when you shift a project from one division to another, do you effectively shift responsibility for that project from one division to another?

A. That would be my interp -- interpretation of shifting a project from one division to another. I've already told you I don't think that that's what happened with this project in my recollection.

Q. Were you in charge of this project?

A. No, I wasn't.

Q. Let's look on page 5933. This discusses "PLASMA NICOTINE 'RISE'"; correct?

A. That's the title of the chart.

Q. This apparently is really talking about the speed with which nicotine reaches the plasma; correct?

A. Well I don't know about speed. What this shows is plasma nicotine levels as a function of time presumably during smoking. I would interpret this to

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be the zero mark, meaning the lighting time.
Q. And what this document shows is that smokers of Marlboro Light get more nicotine quicker than from the two test products; correct?
A. I wouldn't conclude quicker at all. I would conclude a larger plasma nicotine level, however.
Q. Well they also get a larger plasma nicotine level quicker; correct?
A. These to me look to be superimposable curves just shifted. I think the Marlboro Light's curve is shifted up. It proportionately is the same -- same shape, so as a scientist, I wouldn't include -- I wouldn't conclude that one is quicker than another.
Q. Well let's look at it for a second. The first point marked for Marlboro Lights indicates that the smoker of the Marlboro Lights gets approximately 15 milligrams of nicotine in their blood in about three and a half minutes; correct?
A. That's a reasonable interpolation here, sure.
Q. Okay. It takes eight minutes for the test products of your products to hit the same plasma nicotine level; correct?
A. Well the eight-minute point's not quite as high as the triangle there.
Q. So the reality is, is that a Marlboro Light

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delivers enough nicotine to give a smoker a blood plasma level of 15 in 2 and a half minutes and your products never give the smoker in the 20-minute smoking time the same amount of nicotine in the plasma; correct?

A. The Marlboro Light points are higher than either of the two XGT prototypes, but I'll tell you you misunderstand scientifically the notion of speed versus concentration. You asked originally the question that one -- something to the effect that one in fact delivers nicotine faster.

Q. I --

A. I don't -- I don't agree with that. I believe that one delivers a higher concentration, which now is what you're speaking to.

Q. I said more nicotine faster, didn't I?

A. All I know is you used the word "faster" and that implies to me rates or kinetics, and my interpretation of these two -- these three curves as a scientist is a concentration difference in the -- in the plasma, not necessarily a rate difference.

Q. It's basically true that the Marlboro Light delivers more nicotine in a shorter amount of time to the smoker; correct?

A. I think it's -- it's essentially true from these

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curves to the extent that they're correct that Marlboro delivers more nicotine to the plasma for this population of smokers at any time point.

Q. Do you think the R.J. Reynolds scientists who did these curves were inaccurate?

A. I don't understand what you mean the scientists were inaccurate.

Q. Well you said to the extent they're accurate. Are you implying that these are inaccurate?

A. No, I'm telling you I don't -- I don't know the data set and I haven't gone back and reviewed it. As any scientist, you have to assume that something's correct unless you dig into it and find out that it's not. That's all I'm saying.

Q. And as you sit here today, you have no reason to believe that this is incorrect?

A. I have no reason to believe that it's incorrect and I don't intended to imply -- I've never intended to imply that.

Q. Let's look on page 3 -- 5935. This is 1990; correct?

A. Oh, it says "1990" at the top, that's correct.

Q. The conclusion is that "Ultralow-tar cigarettes with enhanced nicotine yields and good smoking characteristics can be produced"; correct?

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A. That's the first sentence on that page, but I don't see where it says "conclusion."
Q. You don't think that's a conclusion?
A. You used the word "conclusion." I'm just -- all I'm saying is I don't see that marked as a conclusion.
Q. Okay. Well, do you think it's reasonable to call that sentence a conclusion?
A. There's a difference between conclusions and observations. I mean, this could well -- equally well be an observation for some specific prototypes. I mean, you know, I'm not trying to nitpick with you and quibble here, but -- but I think that, you know, there's a point here.
Q. Okay. Well then whoever wrote this observed that "Ultralow-tar cigarettes with enhanced nicotine yields and good smoking characteristics can be produced"; correct?
A. That's what's said here.
Q. Now one of the unanswered questions was how this nicotine levulinate masking phenomenon works. Do you know what the masking phenomenon is?
A. I can give you a qualitative description of it in my own terms.
Q. Go ahead.

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A. The addition of nicotine through extracts or through high-nicotine tobaccos, if -- if you use either of those means to increase nicotine yield in the smoke the -- so that you get high -- high nicotine yields disproportionate to the tar level, those products are often judged as extremely irritating, extremely harsh and unsmokable by the consumers.

The addition of levulinic acid theoretically can tie up a large portion of that nicotine as the salt, which resides in the particulate phase, consequently continue to deliver the nicotine to the smoker, but more of the nicotine present is the particulate phase, which reduces the oral sensation of harshness and irritation.

That would be my general interpretation of this masking effect.

Q. Let's go on to page 5938. This talks about the -- the next steps, and it talks about select an LTN Steering Committee. Do you know whether that was ever done?

A. I don't know that that was ever done, and I don't even recall what "LTN" was.

Q. It looks like it's "low tar-to-nicotine ratio," if you look at page 5936.

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A. Yeah. See, that's -- that's a term that I don't recall ever in a -- I don't recall that as an R&D project and I certainly don't recall an LTN Steering Committee.

Q. If XGT was in fact moved to the flavor division, would that explain why you may not have heard of it?

A. As Project LTN?

Q. Yes.

A. Well that's one possible explanation, but again I'm not aware that XGT or GT was ever moved away from being a product development project into the flavor group.

Q. Would you necessarily know that?

A. I'm aware of a lot of things in R&D. I'm certainly not aware of everything.

Q. So is --

A. I guess I'm trying to look at the -- the -- this document that you've handed me and trying to understand what LTN is, and I don't see in any of these that LTN was in fact a flavor division project. In fact, on page 3937 [sic] is a strange block diagram, "PROJECT LTN - PARTIAL TASK LIST" -- "LIST," and includes brands R&D group; product develop -- product -- or P&AT, which is the flavoring group; pro -- process technology and development and

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the AVOCA research farm; the bioresearch group; legal and law.

So it's not clear to me from any of these that this is -- that LTN was a flavor division project.

Q. In any event, you don't recall hearing of LTN at all; right?

A. I don't recall the acronym "LTN."

Q. At what point in time did Project XB start?

A. I can't recall an exact day. I can give you an approximate time, I think. It was right around -- oh, gee. It was in the late '80s or maybe even 1990. I can't recall exactly.

Q. Was Project XB the successor to Projects XGT and GTX?

A. I think that would be a fair characterization.

Q. At some point in time was Project XGT or GTX terminated?

A. I believe those projects were terminated.

Q. Who terminated them?

A. Who specifically?

Q. Yeah. What division terminated them?

A. What division terminated them or an individual?

Q. Well either one. We have some confusion as to whether they went to flavor division or not, so --

A. I -- I really don't know who terminated those.

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I still believe that they were product development projects until they were terminated.

(Plaintiffs' Exhibit 4817 was marked for identification.)

BY MR. O'FALLON:

Q. Plaintiffs' Exhibit 4817 is a document Bates stamp numbered 51170 3121 through 3134. Do you recognize this document?

A. It looks -- it looks familiar, but I haven't seen it in quite a while, I don't think. I don't remember details of it.

Q. This asks a list of questions on the first page; correct?

A. This appears to ask a number of questions, 14 I guess, dealing with Project XB.

Q. The first question is "How much nicotine do we need in a 5 plus or minus milligram product to satisfy normal smokers?" Correct?

A. That's the question.

Q. And the answer is that plasma data would indicate 0.6 milligrams of smoke nicotine; correct?

A. That's what's handwritten to the side of that question.

Q. So it appears that someone at RJR had determined that the average smoker needs about 0.6 milligrams of

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smoke nicotine in order to be satisfied; correct?
A. I don't understand where that notation came from or what was behind it.
Q. In any event, someone at RJR came up with that determination; correct?
A. Well I don't know determination. Somebody has written in in handwriting what you just referred to. I don't know what's behind it.
Q. The second question is "How much free nicotine of the total do we need to get the proper" or -- "organoleptic feel"; right?
A. That's the question.
Q. So apparently free nicotine's important?
A. I think it's a re -- it's a reasonable assumption that nicotine in the vapor phase is important to overall sensory characteristics in the oral cavity and upper respiratory tract.
Q. Then it talks about "What are the limits around the amount of free nicotine before the product is either too harsh or too smooth"; correct?
A. That's what it says.
Q. Do you know what those limits are?
A. No, I don't. I think from an empirical point of view we know that if the nicotine yield from a cigarette for a given tar level is much on the high

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side or much on the low side, it's unacceptable. On the high side, it's too harsh, too strong, too irritating. On the low side, it's too weak, too mild, too bland.

Q. Isn't this talking about pH in the free nicotine, though?

A. Well it's -- it doesn't say anything about pH. It does talk about free nicotine.

Q. And we've again seen free nicotine referred to in the context of pH in a previous document today; correct?

A. I think I've already testified that I think free nicotine or vapor-phase nicotine ought to -- ought to be related to pH.

Q. Were you not involved in this Project XB?

A. Only peripherally.

Q. In any event --

A. Not directly.

Q. -- you weren't listed among the numerous people --

A. No, no.

Q. -- on page 3122; correct?

A. On page 3122 there are 36 people listed, and, you know, I wasn't one of them. I wasn't a direct -- I wasn't directly responsible. I wasn't part of the

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overall XB development team.

Q. Let's look on page 3125. This refers to "ANALYTICAL METHODS." Do you know whether what's listed here are methods you had in place, analytical methods you had in place?

A. I don't recognize any of these six items as anything relating to existing analytical methods. I think my interpretation of this particular page, not knowing the circumstances around it, was that this page was probably outlining a list of analytical methods that they thought they might need to pursue the XB project.

Q. Let's look on page 3127.

A. I'm there.

Q. This appears to be a chart that would indicate the various ways in which XB could be implemented; correct?

A. Well I don't quite understand it. It appears to be two different paths for making products consistent with XB, but at the top it's labeled "E, AGING," so it may be an outline of make -- of the types of products to be made for an aging study. I just really don't know.

Q. In one --

Both paths would start with the use of the KDN

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effluent; correct?
A. On this page, both paths show as starting points KDN effluent.
Q. Okay. And KDN effluent, as we know, contains nicotine; correct?
A. KDN effluent is burley denic effluent, which contains nicotine.
Q. And in both instances they would first concentrate that effluent; correct?
A. That's what this scheme shows.
Q. In one path they would combine that with the G7 extract, add levulinic acid and then make a G7 sheet; right?
A. Yeah, I don't quite understand all the steps in this because it has combine with G7 extract and then concentrated G7/KDN, then add levulinic acid and then make a sheet.
Q. Well that would indicate that they're going to add the KDN effluent to the G7 extract; concentrate that combined G7/KDN extract; --
A. Uh-huh.
Q. -- add levulinic acid, which would result in the production of nicotine levulinate; --
A. And then make the sheet.
Q. -- and then make the sheet; right?

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A. That's a reasonable assumption.
Q. The other path would be to take the concentrated KDN effluent; superconcentrate it; add the levulinic acid to that, which would then result in nicotine salts, pre -- presumably nicotine levulinate; put that on the topdressing; and then put that into the product; correct?
A. That's a reasonable assumption.
Q. Let's look on page 3128. This is talking about satisfaction; correct?
A. At the top of the page it says "F, SATISFACTION."
Q. Number one is "How much nicotine yield as a target?" Correct?
A. You read number one correctly.
Q. So it appears that for this project satisfaction is measured in terms of nicotine yield; correct?
A. I think for this project my interpretation is that satisfaction was -- that nicotine yield was very important to the overall satisfaction.
Q. As a matter of fact, number two, when they talk about a physiological endpoint for satisfaction, they're talking about the effect of nicotine on the central nervous system; correct?
A. In number two they talk about physiological

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endpoints for satisfaction, parentheses, "(EEG)," which I think would be some physiological measure.

Q. That's a brain wave analysis; correct?

A. That's a brain wave analysis.

Q. So what they are testing for physiological endpoint for satisfaction is the brain waves of a smoker; correct?

A. I don't know whether they're testing. I don't know whether this is a wish list or some list suggesting that they've done that kind of work or will do that kind of work. I don't -- all I see is this is a list of different items that speak to the title "SATISFACTION."

Q. In any event, it appears that for this project the RJR employees involved believed that satisfaction is directly related to the physiological impact that nicotine has on the brain; correct?

A. I don't know that I can conclude that from looking at these statements one way or the other.

Q. And then number five talks about "Chronic nicotine dose"; correct?

A. Number five says "Chronic nicotine dose."

Q. And again that's a reflection of the fact that you at R.J. Reynolds knew that smokers tended to smoke for a dosage of nicotine; correct?

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A. I don't agree with that at all.

MR. O'FALLON: Why don't we take a break.

THE REPORTER: Off the record, please.

(Luncheon recess taken at 12:29 o'clock p.m.)

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Source: https://www.industrydocuments.ucsf.edu/docs/qfhd0001

AFTERNOON SESSION

(Deposition reconvened at 1:39 o'clock p.m.)

(Plaintiffs' Exhibit 4818 was marked for identification.)

MR. PLESEC: Dan, just as a housekeeping matter or guidance to me, do you still agree that I will have a standing objection to your examination as we go forward, or would you like me to interpose objections? This morning we had the -- the agreement that I did not have to. How would you prefer to proceed?

MR. O'FALLON: Why don't you go ahead and object when you feel a need to.

MR. PLESEC: Okay.

MR. O'FALLON: Is that acceptable?

MR. PLESEC: Sure.

BY MR. O'FALLON:

Q. Dr. Townsend, I've handed you a document that's Bates stamp numbered 50930 8455 through 8459, and it's been marked as Plaintiffs' Exhibit 4818, and I'm picking off where we left off -- I'm picking up where we left off with Project XB.

Have you seen this particular document previously?

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Source: https://www.industrydocuments.ucsf.edu/docs/qfhd0001

A. It does look familiar. I can't remember the last time I've seen it. I think it's been quite a while ago, but it looks familiar.

Q. On the bottom of the first page there appears to be a date 8/6 of '91. Do you see that?

A. It probably is an 8. I would assume it's 8/6/91. I see the 6 and 91 clearly. Maybe that's old age.

Q. And next to it is the initials DJW. Do you recognize those initials?

A. DJW? I have a pretty good guess who DJW is. It's the J that I'm not sure about.

Q. Who do you think this is?

A. I think this is probably Donna Woods.

Q. And she would be an RJR employee?

A. Yes.

Q. And what department was she in as of 1991?

A. Donna Woods was a member of the flavor group.

Q. Now when you say "the flavor group," is that in the flavor division?

A. In the flavor division. Again I'm assuming that's Donna Woods. I don't recall the middle initial.

Q. Did --

A. I don't know that for sure.

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Q. Based on your recollection, did she work on Project XB?

A. I believe Donna did work on -- on Project XB.

Q. Okay. Again on this very first page, last four Bates numbers 8455, it states the project objective as, quote, "To develop ultra-low tar products with reduced tar-to-nicotine ratios which provide consumers cigarettes with satisfaction and acceptable taste, draw, and burn rate characteristics"; correct?

MR. PLESEC: Objection.

A. That's correct. That's what you said. I mean, that's what it reads.

Q. Let's look on the next page. This is entitled at the top "PROJECT XB, PRODUCT DEVELOPMENT - PHASE 1"; correct?

A. That's what it says.

Q. It then states "What We Know"; correct?

A. That's correct.

Q. And it lists several bullet points; correct?

A. Correct.

Q. The first bullet point under "What We Know" is that, quote, "Nicotine is a key element in providing acceptable taste and satisfaction"; correct?

MR. PLESEC: Objection.

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A. That's what it says, that's correct.
Q. And you would agree with that; correct?
MR. PLESEC: Objection.
A. I agree in general with that statement that "Nicotine is a key element in providing acceptable taste and satisfaction."
Q. It then goes on to state that "Nicotine itself is harsh and irritating"; correct?
MR. PLESEC: Objection.
A. That's what it says.
Q. It says "High nicotine tobacco salts allow increase in smoke yields without corresponding increases in harshness attributes"; correct?
MR. PLESEC: Objection.
A. That's what it says.
Q. Then it says "High nicotine tobacco salts (e.g. Nicotine Levulinate) can be incorporated into G7 sheets, casings or top dressings"; correct?
MR. PLESEC: Objection.
A. That's what it says, correct.
Q. Okay. Under number four it indicates that levulinic acid at this point is approved for consumer testing at 1.5 percent application level; correct?
A. That's --
MR. PLESEC: Objection.

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A. -- what it says.
Q. And then at the last it notes that "Smokers smoking products with 10 percent nicotine levulinate achieved an average of 25 NGs per milliliter" of "nicotine in plasma [typical range 5 to 15 ...]"; correct?
MR. PLESEC: Objection.
A. That's what it says.
Q. Let's look on the next page. This is again talking about "Product Development - Phase 1"; right?
A. That's correct.
Q. It says the currently -- "Current Vantage Ultra Light product delivers acceptable taste and draw characteristics"; correct?
MR. PLESEC: Objection.
A. That's what it says.
Q. It says that "'Satisfaction'" -- and it has that word in quotes; correct?
A. Right.
Q. It says "'Satisfaction,'" in quotes, "in a 5 milligram ultralow-tar product is not provided because of insufficient smoke nicotine delivery"; correct?
MR. PLESEC: Objection.

http://legacy.library.ucsf.edu/tid/i...05a00/pdf
Source: https://www.industrydocuments.ucsf.edu/docs/qfhd0001

A. That's what it says.
Q. It then says "Nicotine levulinate will be used to increase smoke nicotine delivery of Vantage Ultra" -- "Ultra Lights to approximately 0.7 milligrams per cigarette"; correct?
MR. PLESEC: Objection.
A. You read that correctly.
Q. And was that done?
A. I believe in a number of prototypes, as I recall, nicotine levulinate did increase smoke nicotine delivery for those prototypes.
Q. Let's look on page 8459.
MR. PLESEC: Did you say 59?
MR. O'FALLON: Yes, I did.
MR. PLESEC: Thank you.
A. May I say something about this document?
Q. Is this another one of those overhead --
A. Well, no, that's not the point. I'm confused about DJW at this point because this appears to be a -- an entirely product development-type document.
Q. Is there someone else --
A. Well and that -- that's what I'm going back wrestling with, and it -- the DJW may refer to Donna Wilson, who is in fact a product developer. Again I'm not entirely sure about the middle initial.

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Q. Sure. I was just going to look at that one document that I thought we had a list of names on. I'm just not --
A. Yes.
Q. -- finding it.
A. All I know is Donna Wilson is a product developer, and to the best of my recollection, she did work on XB.
Q. Well unfortunately that list of names is of no help since there's nobody with a D and a W in it.
A. Okay. Sorry. We were on the last page.
Q. With that said, yeah, "CONSUMER TEST RESULTS - CONCLUSIONS," do you see that portion?
A. Yes.
Q. It states here that "XB technology is effective at reducing full-flavor/low-tar to ultralow-tar levels while maintaining full-flavor/low-tar nicotine without affecting either acceptance or attributes"; correct?
MR. PLESEC: Objection.
A. Yes. That's what it says, that's correct.
Q. It then indicates that "Products C ... and D ... were similar to Marlboro Lights on all attributes except harshness"; correct?
MR. PLESEC: Objection.

http://legacy.library.ucsf.edu/tid/ith05a00/pdf Source: https://www.industrydocuments.ucsf.edu/docs/qfhd0001

A. That's correct.
Q. Under the next -- well the second bullet after that, it says "Products C (casing application) and D (G7-18 application) performed identically on acceptance and key attributes"; correct?
MR. PLESEC: Objection.
A. That's correct.
Q. G7-18 is the number of the G7 to which extract from the KDN process is added; correct?
A. I believe that's correct. I'd have to go back to the specifications, but I believe you're correct.
Q. Okay. To the best of your recollection, does this document reflect the basic progress that XB had made as of the middle of 1991?
MR. PLESEC: Objection.
A. I'm just going back and looking at a couple things that we skipped over, if you don't mind.
(Witness reviews Plaintiffs' Exhibit 4818.)
A. Without going through the document in detail and referring back to a lot of other documents, I believe that this particular document we're -- we're looking at now, to the best of my recollection, fairly represents a number of things that we learned in the Pro -- Project XB.

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Q. And does it appear to be the progress that that project has -- had made as of the date of this document, the middle of 1991, to the best of your recollection?

MR. PLESEC: Objection.

A. To the best of my recollection, this is a reasonable reflection of the progress made up to that point in time. Now there -- I'm certain that there were other points that are not included here that were made in the project, but I think what's said here, to the best of my recollection, is a reasonable -- reasonable description of at least some of the progress.

(Plaintiffs' Exhibit 4819 was marked for identification.)

BY MR. O'FALLON:

Q. Plaintiffs' 4819 is a document Bates stamp numbered 51210 1040 through 1053. Do you recognize this document?

A. No, I don't.

Q. If you look on the first page, this is again a document entitled "PROJECT XB, STATE OF THE PROJECT"; correct?

A. That's the title of that first page.

Q. If you look at the bottom, it appears that this

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document was written on August 17th of 1992; correct?
A. Yes.
Q. And this document appears to have been prepared by somebody with the initials WMD; correct?
A. Yes.
Q. Are you familiar with those initials?
A. Yes.
Q. Who do you think that is?
A. Well again I'm not certain about the middle initial, but it may well be one of the product developers, Watson Dufoure.
Q. Was that an individual who, to the best of your recollection, was working on Project XB?
A. Yes.
Q. The first page indicates a title or a section entitled "PRODUCT STEWARDSHIP"; correct?
A. Yes.
Q. And what do you understand that to mean?
A. Product stewardship is in fact examining the product changes to make sure that we don't increase biological burden, don't increase specifically biological activity.
Q. When it says that "High nicotine tobacco extracts are cleared for use up to 3.0 percent blend

http://legacy.library.ucsf.edu/tid/i_105a00/pdf Source: https://www.industrydocuments.ucsf.edu/docs/qfhd0001

nicotine," what do you interpret that to mean?
A. Well I -- I'm just giving you my opinion. Again I don't know what was in the mind of the author. Typically our toxicology group will look at proposed or potential changes and determine whether those changes are consistent with our approach for toxicological assessments for ensuring that we don't increase biological activity.

So my judgment would be that high-nicotine tobacco extracts -- if I had to guess, high-nicotine tobacco extracts are cleared by our toxicology group for use up to a total of 3.0 percent blend nicotine.
Q. Okay. And that would be for human testing; right?
A. That would be my assumption, sure.
Q. And when we say "testing," we're not talking about biological testing; we're talking about basically smoke testing, right, to smoke the cigarettes and see how they taste?
A. We go through a pretty detailed process of evaluation and sign-offs before we do any human smoker studies. I would assume this was for consumer acceptance testing.
Q. Let's look on the next page. There's a section entitled "HUMAN SMOKING BEHAVIOR." Do you see that?

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Source: https://www.industrydocuments.ucsf.edu/docs/qfhd0001

A. Yes.
Q. The first bullet point indicates that "1 to 2 milligram prototypes achieve lower blood nicotine levels than 5 milligram products but more than conventional 1 to 2 milligram products"; correct?
MR. PLESEC: Objection.
A. Yeah, that's what it says.
Q. It then says that "Nicotine excretion studies confirmed these findings"; correct?
MR. PLESEC: Objection.
A. Yes.
Q. The next bullet point says that "Numerous 5 milligram prototypes have matched blood nicotine levels and human smoking behavior of full-flavor/low-tar smokers"; correct?
MR. PLESEC: Objection.
A. That's what it says.
Q. So it appears that full-flavor/low-tar smokers are able to get the same level of nicotine from a 5-milligram prototype as they do from the full-flavor/low-tar cigarette; correct?
MR. PLESEC: Objection.
A. Well I take it for what it says, numerous 5-milligram prototypes have matched blood nicotine levels and human smoking behavior of at least -- my

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Source: https://www.industrydocuments.ucsf.edu/docs/qfhd0001

interpretation, of some FFLT smokers.
Q. And the 5-milligram prototypes are prototypes of the ultralow-tar products; correct?
A. 5 milligram is on the upper end of the ultralow-tar product category.
Q. But it would still be considered an ultralow-tar product; right?
A. Certainly.
Q. Okay. So what the researchers have done is by manipulating the nicotine in this way, is they've been able to deliver to a full-flavor/low-tar smoker the same amount of nicotine in an ultralow-tar cigarette that they're getting out of their full-flavor/low-tar cigarette; correct?
MR. PLESEC: Objection.
A. I think it was -- it was certainly part of the XB project as well as the prior projects to deliver higher nicotine levels at lower tar levels, and we've seen in some of the earlier documents that we've looked at that -- that higher nicotine -- in one case higher nicotine plasma levels were obtained.
Q. And if we look down at bullet four, it states that "Nicotine uptake levels for smokers of full-flavor, full-flavor/low-tar, and 5 milligram ultralow-tar products are the same at 15 NGs per

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milligram rise"; correct?

MR. PLESEC: Objection.

A. That's what it says.

Q. So apparently all the smokers tested here had basically the same blood level of nicotine regardless of the product they smoked; correct?

MR. PLESEC: Objection.

A. Well I don't understand. I mean, I understand what that bullet says, I think, but I don't understand because in the first bullet they're talking about differences in blood nicotine level.

Q. Well what they're --

A. So I'm not sure how we can have it both ways or how one can have it both ways.

Q. Well I think they can have it -- I don't think they're having it both ways. I think what they're saying is that with the 1- to 2-milligram prototypes, you can't quite get up to the 15-ng-per-milliliter rise that you can with the full-flavor, the full-flavor/low-tar and the 5-milligram ultralow-tar cigarettes. Isn't that what they're saying?

MR. PLESEC: Objection.

A. Well again I don't know. I mean, we could -- I suppose it's possible to interpret it that way. I -- I just don't know.

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Q. And ultimately the goal here is to try to find a 1- to 2-milligram prototype that actually will allow a smoker to achieve that -- that optimal nicotine blood level -- that blood nicotine level; correct?

MR. PLESEC: Objection.

A. Well I don't know that that's an optimal blood nicotine level. I do know that the XB project was to deliver higher nicotine yields to the smoker at lower tar levels.

Q. And one of the things they're trying to determine is what is the optimum smoke nicotine yield; right?

MR. PLESEC: Objection.

A. Well I don't know that.

Q. Well look at the next bullet point. It says --

A. Okay.

Q. -- "Concentrated research is required to determine optimum smoke nicotine yield for full-flavor/low-tar and upper end ultralow-tar smokers"; right?

MR. PLESEC: Objection.

A. That's what it says.

Q. So what they're really trying to determine is, number one, what is the ult -- the optimum nicotine level that a smoker needs to achieve and, two, how do

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we make an ultralow-tar product in this 1-to-2-milligram range that can achieve that level; right?

MR. PLESEC: Objection.

A. Well I think you've gone beyond what's said here in that you've -- in talking about optimum smoke nicotine yield, that's easy for me to understand, but I don't understand how that -- how you're translating that to optimum smoke -- I mean, optimum nicotine intake by -- for smokers. I mean, I see the phrase "to determine optimum smoke nicotine yield for FFLT and upper end ULT smokers." I mean, that to me is an important element of the overall XB project. But to imply that that somehow means that there's a target body level or blood level of nicotine I think is maybe a stretch.

Q. Well if you look at -- at bullet point number four again, it appears that based on this testing the nicotine uptake levels for smokers of full-flavor, full-flavor/low-tar and the 5-milligram ultralow-tar products were the same at a 15-ng-per-milliliter rise, so apparently those smokers smoking very different products in terms of delivery all managed to have a blood nicotine level that was basically the same; correct?

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MR. PLESEC: Objection.

A. Well if we accept that that is an observation from the laboratory that 15 nanograms per milliliter was the level for smokers among those three category products, I mean, that's an observation that's been seen in other experiments, but there are also other experiments where that observation hasn't been seen. So again, to me the -- the question is -- is focused on is there an optimum serum nicotine level as opposed to is there an optimum smoke nicotine yield. I -- I certainly look at the latter, the optimum smoke nicotine yield, as an important part of the development of XB.

Q. And in all likelihood, those two levels are probably related; correct?

MR. PLESEC: Objection.

A. Well I don't know. I -- I don't know that at all because I'm not ready to assume that there is an optimum serum nicotine level for smokers. I just don't know whether there is or not.

Q. Let's look on the next page, and that's last four Bates numbers 1042.

A. Uh-huh, yes.

Q. The third bullet point indicates that "A source of high nicotine tobacco extract is available to

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support up to" a "3 share of market achieving a blend nicotine increase of 0.7 to 1.0 percent," and then it identifies that as "(RJR Burley denicotinizing process)"; correct?

MR. PLESEC: Objection.

A. That's what it says.

Q. How many cigarettes would have to be produced to support a three share of market?

A. What is the volume of a 3 percent share of market? Is that your question?

Q. Yeah, in terms of cigarettes, yeah.

MR. PLESEC: Produced?

MR. O'FALLON: Well certainly.

A. In -- well let's see. The date of this document was 1992, so I would -- let's estimate in '92 that the U.S. market was 540 billion cigarettes, so we'd be talking about 3 percent of 540 billion cigarettes.

Q. 15 billion cigarettes?

A. Approximately.

Q. I'm a lawyer. I don't usually do math.

So you had enough excess nicotine from the nicotine -- from the burley denicotinization process to support up to a 1 percent increase in nicotine for 15 billion cigarettes as of 1992?

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MR. PLESEC: Objection.
A. That would be our interpretation from this and my assumption of the market volume in 1992.
Q. At the current time that nicotine was simply being burned?
A. Yes.
Q. Would you look at the next page, Bates number 1043.
A. Okay.
Q. This is entitled at the top "CURRENT DEVELOPMENT ACTIVITIES" for Project XB; correct?
A. Yes.
Q. And there's a heading that's entitled "SATISFACTION" and, in parenthetical, "(Nicotine)"; correct?
A. Yes.
Q. One of the bullet points, the first one, indicates the "Optimum full-flavor/low-tar Nicotine Level (ULT to follow)." Is that something they're still trying to discover --
MR. PLESEC: Objection.
Q. -- or define?
MR. PLESEC: Same objection.
A. I don't know. That's probably one way to interpret this. I don't know what is exactly meant

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here, whether it's the optimum FFLT nicotine smoke level. It could be the optimum FFLT nicotine serum level. I tend to think it would be the smoke level, but it depends on what the author meant here. It's unclear.

Q. It could be either one; right?

A. I think it could be either one. As a product developer, I think they're speaking to nicotine smoke delivery level, but that would be my interpretation.

Q. And one way to measure the nicotine smoke delivery would be to measure the nicotine in the blood; correct?

A. No.

MR. PLESEC: Objection.

A. No. We would measure smoke delivery on smoking machines.

Q. But wouldn't you also agree with me that the nicotine level in the blood is a function of the nicotine delivered in the smoke?

MR. PLESEC: Objection.

A. Overall across all smokers probably so. I think for any individual smoker I think there's going to be differences in puffing behavior that will cause some deviation between smoke yields and -- and serum levels.

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Q. In all likelihood, each individual probably has their own nicotine level that they smoke to; correct?

MR. PLESEC: Objection.

A. I don't agree with that really at all.

Q. Let's look on page 1047.

A. Okay.

Q. It indicates under "PRODUCT" under the third bullet point that the high-nicotine tobacco extract facility is in place. Is that referring to the KDN extract facility?

A. This is --

MR. PLESEC: Objection.

A. -- the third bullet down?

Q. Yes, it is.

A. It says "High nicotine tobacco extract facility in place." I would assume that's the KDN extract that they're referring to because that's the only -- I would assume that's the only extract they're talking about.

Q. So as of this point in time, August of 1992, the XB project is still very much alive; correct?

MR. PLESEC: Objection.

A. From this document and also from my recollection, I believe XB was alive in August of

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'92.

THE REPORTER: Off the record, please, to change tape.

(Discussion off the record.)

(Plaintiffs' Exhibit 4820 was marked for identification.)

BY MR. O'FALLON:

Q. Plaintiffs' Exhibit 4820 is a document Bates stamp numbered 51463 1787 through 1790. Do you recognize this document?

A. No, I don't.

Q. This is a document in -- that involves the REST extraction technology we've discussed earlier; correct?

MR. PLESEC: Objection.

A. I believe that's correct.

Q. Okay. Under the --

On the first page it indicates that this was written on September 1st of 1993; correct?

A. September 1st. Actually the year is blurred. Well the year on my copy's blurred. I'm not certain.

Q. Is it your recollection that --

A. Something 3 perhaps. Go ahead.

Q. Is it your recollection that the REST project

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was ended in approximately 1993?
A. That seems like a reasonable time frame.
Q. Okay. Under the summary it states that "In the late 1980's, exploratory development was initiated to investigate technology for the removal, separation and modification of tobacco water solubles"; correct?
A. That's correct.
MR. PLESEC: Objection.
Q. "In response to a competitor's efforts to market a low nicotine product, this technology was directed during 1989 through 1991 toward a process for producing a low nicotine cigarette"; correct?
MR. PLESEC: Objection.
A. That's what it says.
Q. Now the competitors --
The competitor identified there was actually Philip Morris; correct?
MR. PLESEC: Objection.
A. Well in this paragraph it doesn't identify the competitor. From my knowledge, I believe it to be Philip Morris.
Q. Okay. And apparently at this point in time Philip Morr -- or R.J. Reynolds did not have a low-nicotine cigarette on the market, correct, --

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MR. PLESEC: Objection.

Q. -- at least as defined here?

MR. PLESEC: Objection.

A. As we talked yesterday, Reynolds did have a low-nicotine product on the market, but not a high-tar/low-nicotine product as Philip Morris was marketing.

Q. But you had a low-tar/low-nicotine product on the market?

A. That's correct.

Q. Okay. It then says that "During 1991 as the potential for a low nicotine product lost promise, efforts shifted to extract modification to improve smoking quality and/or reduce cost"; correct?

MR. PLESEC: Objection.

A. That's what it says.

Q. It says "Numerous products were prepared to control water solubles, remove nitrates and modify tobacco extracts"; correct?

MR. PLESEC: Objection.

A. You've read that correctly.

Q. Under "STATUS" it indicates in the second paragraph that "Washed burley stems in reconstituted G-7 sheet has been identified as an application of extraction technology"; correct?

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MR. PLESEC: Objection.

A. Yes.

Q. Does G7 usually contain washed burley stems?

A. Not usually. There is one formulation in our many different formulations of G7 that is a washed burley stem sheet.

Q. What's the number of that?

A. G7-30, I believe.

Q. Was that product ever commercialized?

A. It's in EW, the product we discussed yesterday. It may be in one or two other small brands. I'm not certain.

Q. Do you know what those brands would be?

A. Not off the top of my head. Can be determined.

Q. Was the extraction technology applied to these washed burley stems in the commercialized product?

A. The REST extraction technology was not applied to the washed burley stems used in the sheet for G7-30.

Q. Was some other extraction technology applied to the washed burley stems?

MR. PLESEC: Objection.

A. If I understand your question correctly, the G7-30 sheet is made of burley stems that have been water washed to remove nitrates just in a very simple

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water washing process, not a complicated process like REST.

Q. Is any extract --

Is any extract then added to that G7 sheet, G7-30 sheet?

A. That ex -- extract I believe is sewered.

Q. Thrown away?

A. I believe it's placed in the sanitary sewer. That's my recollection.

Q. Is any extract from any other process then added to this washed burley stem sheet?

A. The washed burley stems, which results in a reduction in nitrate level, then goes into the G7 process. Scrap and other stems are included as well as tobacco dust, and then it goes through the normal G7 process. That's my understanding.

Q. Why is tobacco dust used?

A. It's a -- it's a product of the stemming operation, and tobacco dust of course is expensive so we try to include it to the degree we can and still make a decent paper sheet. We try to include it in G7.

Q. Otherwise you'd just throw the dust out?

A. We used to landfill tobacco dust.

Q. What's the nicotine content of tobacco dust?

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A. Well it varies depending on the tobacco that's -- that it's come from. Flue-cured tobacco dust typically is about 1 and a half to maybe 2 and a half percent nicotine. Burley tobacco dust is slightly higher than that, and Turkish tobacco dust is somewhere in the neighborhood of 1 percent nicotine.

Q. Let's look on page 1178, and specifically look at the --

MR. PLESEC: You said "1178."

A. 1178?

Q. Oh, I'm sorry. It's 1 -- I'm -- you're right. 1788.

A. Okay.

Q. The next page.

A. All right.

Q. The second full paragraph down that starts "During 1991."

A. Okay.

Q. It states that "During 1991, efforts began to shift from 'no nicotine' products to controlled nicotine products because the marketplace did not indicate a demand for 'no nicotine' products"; correct?

MR. PLESEC: Objection.

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A. That's what it says.
Q. At this point in time, did RJR have the technology in place to make a no-nicotine product?
MR. PLESEC: Objection.
A. As we talked yesterday, I don't think it's possible to make strictly speaking a no-nicotine product. I think in this document "no nicotine" is in quotes, meaning, at least in my interpretation, a competitor for the Merit denic or Next-type product, which is a high-tar, very, very low-nicotine product.

We did not have the processing capability to develop a similar cigarette to what Philip Morris did. We did instead turn to very low-nicotine tobaccos as a -- as a viable approach for a competitor. We carried that development to a point and then -- and then terminated the project.
Q. It then says "A significant accomplishment during" this "period was a Nicotine RSM Study relating nicotine content to consumer satisfaction"; correct?
MR. PLESEC: Objection.
A. That's what it says.
Q. What is an RSM study?
A. RSM is response surface methodology.

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Essentially it's a statistically designed experimental plan for evaluating the effects of some variable that you want to examine. It's a fairly well-known statistical method for planning experiments.

Q. And apparently this statistical study was successful in relating nicotine content to consumer satisfaction; correct?

MR. PLESEC: Objection.

A. That's what the author seems to say here. I'm not aware of that Nicotine RSM Study during that period of time, so I don't know.

Q. The last sentence of that paragraph also states that "Sensory testing concluded that 'nicotine is a strong determinant of product perception'"; correct?

MR. PLESEC: Objection.

A. That's what it says.

Q. Let's look on the next page, Bates number 1789.

A. Okay.

Q. Under "STATUS" the third sentence of the first paragraph states that "For burley stems, a less expensive extraction method has been selected, and plans are underway for the inclusion of washed burley in reconstituted tobacco sheet (G-7)"; correct?

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MR. PLESEC: Objection.

A. That's what it says, that's correct.

Q. And that's the process that you've talked here about today; right?

A. I believe so.

Q. It then says "The most recent work was directed at extract modification to improve the flavor of DSKS product"; right?

MR. PLESEC: Objection.

A. That's what it says.

Q. Now when it talks about extract modification, what is it talking about? What extract is it talking about?

MR. PLESEC: Objection.

A. I -- I frankly don't know. I don't re -- don't remember what DSKS is, so I don't -- I really don't remember what this is aimed at.

Q. Well when it's talking about extract modification here, it's talking about extract that's going to be added on to a product, not taken out of a product; correct?

MR. PLESEC: Objection.

A. Well I don't -- I don't know that because the -- the whole thrust behind the REST process in general was to take a material, remove water-soluble

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extracts, somehow process those extracts -- extracts and put them back on, and to be quite frank, the REST process was driven by process engineering. They developed appro -- general approaches and frankly were trying to find a home for it, I think.

That was my understanding of extract modification, to remove something, process it, to reduce constituents or to improve flavor or to whatever and put it back on that material.

Q. Well that was my understanding, too, and that's why I was a bit confused when you said that the washed burley process was really about removing nitrates because I thought the whole purpose behind the REST process wasn't to just take extract out, it was to take extract out, modify it and put it back.

A. That's my understanding of the REST process, and that's why I, too, don't understand these statements about burley stems, washed burley stem sheet, because the reason for washing burley stem sheets is it contains a high concentration of nitrates, which we want to remove.

Q. Well but the other reason for potentially extracting the burley stems would be because they contain a high level of nicotine, which you're trying to remove, modify and then add back on to a product;

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correct?

MR. PLESEC: Objection.

A. Stems generally contain a pretty low level of nicotine.

Q. Well is it possible that what this is talking about then is a process whereby the burley stems are washed to remove the nitrates, but then a modified extract is added to increase the nicotine level back to some spot?

MR. PLESEC: Objection.

A. If you're asking is it possible, I suppose it's -- that's one possible interpretation. I don't think that's a likely interpretation.

Q. Well I'm trying to understand the documents and your process, and obviously I'm at a huge disadvantage because I've only got selected documents that have been produced. And I'm trying to figure out what happened, whether this extract modification and this extract technology that we've been talking about -- what happened to it.

A. Well --

MR. PLESEC: Objection.

A. And -- and -- and I am seriously trying to help. In the last sentence that we've been focusing on, "The most recent work" -- I quote, "The most

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recent work was directed at extract modification to improve the flavor of DSKS product."

Q. Right.

A. I don't know what DSKS is, and it may well be that the REST process was intended to extract material, process it and reapply it to whatever DSKS is. I -- I just simply don't know.

Q. You would agree with me that the reason you'd modify extract is for the purpose of putting it back on a product? That would be the logical implication of why you'd modify it; right?

MR. PLESEC: Objection.

A. That's my understanding for the REST process objectives.

Q. Okay. Let's look down at the bottom where it talks about "ALTERNATIVES."

A. Yes.

Q. It says "An" alternative "less expensive extraction method will be used to wash burley stems for use in G-7." Alternative "methods have been pursued for XDU"; correct?

MR. PLESEC: Objection.

A. That's what it says.

Q. Now XDU is Eclipse; right?

A. XDU was Eclipse development, the early stages of

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Eclipse development.

Q. And we do know that some extraction method apparently similar to REST was applied to the washed burley stems; right?

MR. PLESEC: Objection.

A. I don't think that the extraction for the burley stems going into G7-30 was necessarily similar to REST at all. I think it was a very simple process where one takes a kettle with burley stems and does a water wash, then takes those stems to the G7 process. It's really quite simple I think.

Q. Are you positive that the extract from that process wasn't modified and then somehow reapplied to G7?

MR. PLESEC: Objection.

A. The extract from the burley stem washing?

Q. Yes.

A. I'm not 100 percent sure, but I think it's -- it's a very high probability in my mind. We can certainly go back to the documents and find out. I don't think that the extract was processed and reapplied. The purpose of washing the burley stems was to remove the nitrates.

Q. We've now looked at documents that have spanned for basically six years, from 1987 to 1993, all in

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pursuit of nicotine manipulation. Is there any portion of this nicotine manipulation program that's still on line at RJR?

MR. PLESEC: Objection.

A. We continue to have a project at RJR that is attempting to make consumer acceptable products consistent with the Russell hypothesis.

Q. Is Project XB still in existence?

A. No, it isn't.

Q. When was it terminated?

A. I can guess. I think maybe my best guess would be '93 to '94, thereabouts.

Q. What replaced that project?

A. Well nothing --

MR. PLESEC: Objection.

A. In terms of going after that objective of XB or a similar objective to XB?

Q. Right.

A. Nothing immediately replaced it.

Q. But something did eventually replace it?

MR. PLESEC: Objection.

A. We started a new project with a somewhat similar objective to XB at a later date.

Q. What's the name of that project?

A. The name of that project is a Russell Product

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Development Project.
Q. Was the KND process shut down at about the same time that product XB was terminated?
A. To the best of my recollection, it was a similar time, plus or minus a year or so. I can't recall the exact dates.
Q. Does R.J. Reynolds continue to exercise some nicotine control on its burley tobacco?
MR. PLESEC: Objection.
A. By "control," you mean denicotinization?
Q. Yes.
A. We do not denic any of our tobacco products or tobacco materials.
Q. How do you then control for the crop variations in the nicotine content of the various tobaccos?
A. We undergo -- as crop -- as crops change or the availability of crops change for our use in production, we do make some minor tobacco blend modifications so we can to a small degree change the blend composition. Tobacco nicotine level in the final blend still varies considerably.
Q. Doesn't that cause some problems for FTC testing?
A. It certainly causes problems in terms of manufacturing consistent cigarettes and making sure

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that our FTC nicotine values that we report are accurate representations of -- of the manufactured product.

Q. Well if there's a great variability in the nicotine in the final product, wouldn't that be indicative of the fact that you're not delivering products that meet those FTC specifications?

MR. PLESEC: Objection.

A. I said it's very difficult to do. We do have to make blend changes to accommodate the changes in nicotine in the various blend components. We are able to achieve that within -- within the tolerance of the FTC method.

Q. So when you say --

A. We -- excuse me.

We ensure that the -- that the reported -- the measured and reported nicotine yield levels by FTC test method are accurate.

Q. We also talked about genetic engineering. Is it your recollection that RJR has engaged in some genetic engineering aimed at nicotine manipulation?

MR. PLESEC: Objection.

A. I haven't kept up with everything we've done at Reynolds in -- in the agronomy or genetic engineering of tobacco. I guess it would be my -- my

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recollection at this point that we have looked at possibilities of genetic engineering and nicotine levels in tobacco. I think more recently, as I've already indicated, a lot of our genetic work on tobacco has been aimed at -- at pest control and mold control.

(Plaintiffs' Exhibit 4821 was marked for identification.)

BY MR. O'FALLON:

Q. Plaintiffs' 4821 is a document Bates stamp numbered 51108 7875 through 7876. Do you recognize this document?

A. No, I don't.

Q. The summary of this is entitled "Proposed RJR/Biosource" Genetic Corp -- "Genetics Corporation Joint Research Agreement"; correct?

A. That's the title of it.

Q. Have you ever heard of Biosource Genetics Corporation?

A. I've heard of Biosource. I don't know much about them at all.

Q. On page two of this document, there's a section entitled "Nicotine manipulation"; correct?

A. On page two it says "Part II - Nicotine manipulation."

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Q. And it states that "Under the work plan of this three-year project (attached), RJR will utilize proprietary technology and receive technical assistance from Biosource in an ongoing research program aimed at precisely controlling nicotine levels in tobacco plants"; correct?

MR. PLESEC: Objection.

A. That's what it says.

Q. Is it your recollection or understanding that this work in fact went forward?

A. I really don't know whether this went forward or not. I think there was a, in fact, joint venture between Biosource and RJR, and I don't know what they did or how far they got.

Q. Do you know whether that's still in effect?

A. I think it is not in effect is my best estimate.

Q. Do you know whether as a result of that project RJR was able to successfully manipulate nicotine through genetics?

MR. PLESEC: Objection.

A. I don't know to what extent they were successful or not in their scientific endeavors. I think the joint venture was a financial flop. I think the joint venture for some reasons that are unknown to me

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no longer exists.
Q. Was it your understanding that they were -- that RJR and Biosource together were going to enter into a joint venture to genetically engineer tobacco and then somehow sell that tobacco?
MR. PLESEC: Objection.
A. I don't know the details of the intent of the joint venture. I think it -- my -- my opinion is that it was a broad-range joint venture looking at a number of things.
Q. But you don't know whether it was successful in producing this genetically engineered tobacco?
MR. PLESEC: Objection.
A. I don't know whether it was successful or not.
Q. I'd last like to move on to the subject of Premier. Were you involved in that development project?
A. Peripherally. I wasn't responsible for it.
Q. Okay. So far all the projects we've discussed here, XB, XGT, GTX, those have all been projects you've only been peripherally involved in; correct?
A. GT, XGT, XB and Premier I've only been peripherally involved in.
Q. I'd like to hand you a document that's been previously marked as Plaintiffs' Exhibit 1610.

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(Discussion off the stenographic record.)

Q. Have you seen Plaintiffs' Exhibit 1610 previously?

A. I would say I've seen parts of this. There are some parts of this I don't recall seeing, but I certainly have seen many of these pages.

Q. Are these overheads of some type?

A. I believe them to be overheads.

Q. Is this a -- a presentation that was made to somebody?

A. That would be my best guess.

Q. Do you know who it was made to?

A. This particular set of apparent overheads, I have no idea who that was made to. Similar presentations have been made to -- to many groups of scientists inside the company and outside the company, so I couldn't begin to guess.

Q. The Premier cigarette did contain nicotine; correct?

A. Yes, it did.

Q. And why is that?

A. Because nicotine is an important part of the smoking process, smoking satisfaction and acceptance of cigarettes.

Q. And it contained very little tar; correct?

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MR. PLESEC: Objection.

A. It actually -- well a cigarette doesn't contain tar. A cigarette only delivers tar or yields tar, and a Premier yielded about 8 milligrams per cigarette of what one would measure as tar. But the nature of the tar was really quite different.

Q. In what sense?

A. Chemical composition.

Q. Sorry to take a little time. I'm just trying to find the page as I'm --

A. Okay.

Q. Let's look at page 6198.

A. You said 98?

Q. Yes.

A. Okay.

Q. Do you have that in front of you?

A. I'm there, I think.

Q. At the top it says "Slide:FDA028alt Opid." Was this a slide presented to the FDA?

MR. PLESEC: Objection.

A. I don't know whether this specific slide was shown to the FDA or not. I know we have made presentations to the FDA.

Q. Okay. This is a summary of biological tests conducted on the mainstream smoke from Premier as

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compared to a reference cigarette; correct?
A. I would say this is for mainstream condensate comparing a reference cigarette versus Premier --
Q. Okay.
A. -- for three -- five assays, five biological assays.
Q. What reference cigarette did you use?
A. For Premier we typically used a Kentucky reference cigarette.
Q. And is the Ken --
Is the Kentucky reference cigarette roughly similar to any RJR commercialized product?
A. I would say it's quite similar in construction. The blend, of course, is not exactly the blend that we use in our commercial products, but it employs typical commercial-like filters. It employs air dilution.
There's a range of Kentucky reference cigarettes of different tar yields, so the scientists will choose that one Kentucky reference product that close -- most closely matches the tar yield of the product you want to study.
Q. Okay. Do you know which product you were wanting to study here; that is, what product were you trying to compare Premier to, what commercial RJR

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project?

A. What commercial product?

MR. PLESEC: Objection.

Q. Uh-huh.

A. No, we compared -- well, we -- we made a number of comparisons. We compared the Premier product with the Kentucky reference product; I believe it was 1R4F Kentucky reference. We also made a number of comparisons in chemistry and other attributes, performance attributes, between Premier and -- I believe we made a comparison between Premier and Now.

Q. Okay. The 1R4F Kentucky reference cigarette, which RJR commercial product is that closest to?

A. Possibly a Camel Light I would suppose. That would be my guess.

Q. Now let's talk about the condensate studies that are on page 6198. First of all, what's the Ames study?

A. That's a mutagenicity study that is a test for smoke condensate.

Q. And mutagenicity is what?

A. Well I'm not an expert in this area. My understanding is that with the Ames test one uses salmonella or some variety of salmonella and uses

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some type of activation, exposes it to smoke condensate and determines mu -- genetic mutations.

Q. So in other words, what this indicates is that the reference cigarette -- the condensate from the reference cigarette caused the cells to mutate; correct?

A. That's correct.

Q. And you understand that mutation of cells is thought to be one of the precursors to cancer; right?

MR. PLESEC: Objection.

A. Well I don't -- I don't understand the details of what the Ames test means. I think for many people and I think Ames himself when he invented the test saw that as one screening tool for possible tumorigenicity -- or tumor production, rather.

Q. Or carcinogenicity?

A. Not tumorigenicity.

Q. Right. It's --

The Ames test is one screening test for carcinogenicity; correct?

A. Well I don't know that there's a direct relationship between the two at all. I know that -- that it's a mutation test. I don't know what the health implications are in terms of carcinogenicity

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or anything else. We're outside my area.
Q. In any event, the reference cigarette, which would be closest to the RJR Camel Light, failed that test; correct?
MR. PLESEC: Objection.
A. If I'm correct in assuming that that is the Kentucky reference 1R4F, the Ames test for condensate from that reference cigarette showed a positive result.
Q. Which means it mutated?
A. Which means that there were revertants or mutations.
Q. Okay. What's the HGPRT test?
A. I really don't know what that one is.
Q. How about the SCE test?
A. That's sister chromatid exchange.
Q. What does that measure?
A. Well it's -- it's -- it's an in vitro test. It obviously has something to do with the chromatids. I have no idea of the details of what that test is.
Q. What's a chromatid?
A. I'm -- I was very poor in biology. I couldn't begin to tell you.
Q. In any event, this is another test to test whether or not this condensate is biologically active

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in an adverse way; correct?

MR. PLESEC: Objection.

A. The sister chromatid exchange test, like the Ames test, is a -- is a biological assay that we use routinely at Reynolds to evaluate changes to cigarettes.

Q. Okay. In this case the reference cigarette, which is much like the R.J. Reynolds Camel Light, failed that test; correct?

MR. PLESEC: Objection.

A. This SCE result for the reference product, whatever that really was, showed a positive response.

Q. Okay. What's the CA test?

A. Chromosome aberration.

Q. Okay. And what does that test measure?

A. Well again I'm not entirely sure. It's a routine biological test that we conduct at Reynolds.

Q. Chromosome aberration, does that mean that the condensate causes chromosome aberration; that is, some adverse change to the chromosomes of the cells?

MR. PLESEC: Objection.

A. Not being an expert in the area, that might be a reasonable guess, I would think.

Q. Okay. And the reference cigarette, which is

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again much like the RJR Camel Light, failed that test as well; correct?

MR. PLESEC: Objection.

A. The CA test, the SCE test and the Ames test all showed positive results for the reference product, whatever that really was.

Q. In other words, the reference cigarette, the cigarette that's much like an RJR commercial product, caused changes in cells that were adverse; correct?

MR. PLESEC: Objection.

A. Smoke from the reference product showed a positive result on those tests that we have discussed. That means that there was a positive biological endpoint.

Q. And a positive biological endpoint on these tests is a bad thing; right?

MR. PLESEC: Objection.

A. Again I'm not an expert in the area. I don't know to what degree that's bad or not. I know that cigarette smoke causes positive changes on these assays.

Q. And these assays are thought to be measures of whether or not the product in question will potentially cause cancer or other cellular damage; correct?

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MR. PLESEC: Objection.

A. I don't know and I don't know whether anyone knows the relationship between any of these tests and cancer. These are tests, however, that our biologists and toxicologists use to evaluate the smoke from products.

Q. And of course you're using the fact that these tests were negative for Premier to try to convince presumably the FDA and others that Premier is a safer cigarette; correct?

MR. PLESEC: Objection.

A. Again I don't know whether this slide were in fact -- was in fact presented to the FDA; however, what we've done in the Premier presentations to a variety of scientific audiences is show that Premier in fact successfully reduced to a major degree the chemistry and reduced to a major degree biological assays.

Q. Would it also be fair to say that what this chart shows is that Premier reduced the biological activity of the smoke delivered by the product?

MR. PLESEC: Objection.

A. I think it would be fair to say that the smoke from Premier showed major reductions in biological activity.

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Q. And in the context of cigarettes, biological activity is thought to be a negative since the only biological activity associated with cigarettes is negative activity; that is, the production of cancers, emphysema and other disease; correct?

MR. PLESEC: Objection.

A. Cigarette smoke shows positive results on a number of biological assays. The relationship of those to any disease, including cancer, is certainly not known by me. I have no idea. The fact that Premier did not show positive results on these assays, in my opinion, suggests that it's a step in the right direction.

Q. Are you familiar that business in general and industries in general that produce products that are meant to be ingested by human beings in one fashion or another use the Ames test in order to screen out those products which they will not sell to the market?

MR. PLESEC: Objection.

A. I'm not familiar with any details like that.

Q. Do you think it would be unethical to sell a product to the market knowing that that product created adverse biological activity in a human being?

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MR. PLESEC: Objection.

A. I couldn't begin to render an opinion on that.

Q. Do you have any opinion on that?

MR. PLESEC: Objection.

A. I couldn't give you an opinion on that, no.

Q. Let's look at page 6199.

A. Okay.

Q. There's a discussion here of inhalation exposure. Were those inhalation tests completed?

MR. PLESEC: Objection.

A. We conducted and completed a number of inhalation tests for Premier.

Q. And the mouse skin painting, that was completed?

A. We conducted --

MR. PLESEC: Objection.

A. We conducted mouse skin painting studies and they were completed.

Q. What were the results of the inhalation studies as to the reference cigarettes?

A. Well I suppose we could turn to the next couple pages.

Q. Does it have those? Oh, great. I'm sorry. My mistake. I'm sitting here looking for them. I didn't see them.

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The next page is 6200. This is a 90-day inhalation study. Squamous cell metaplasia of the larynx; correct?

A. I believe this is specific for the rat animal.

Q. Okay.

A. I'm sorry. Which page are you on? Yeah.

Q. 6200.

A. Yeah, that's for the rat.

Q. Right. This is a --

This is a 90-day inhalation study of the rat; correct?

A. That's correct.

Q. And squamous cell metaplasia of the larynx is listed. Is that the biological endpoint?

A. I believe it is, but again I'm not an expert in the area.

Q. Okay. Do you know what squamous cell metaplasia is?

A. I can only give you a layman's interpretation that may well be wrong, and I believe it's a thickening of the lining in the larynx.

Q. Is squamous cell metaplasia thought to be a precursor to cancer?

A. I don't --

MR. PLESEC: Objection.

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A. I don't know.
Q. In any event, it appears that as to the reference cigarette; that is, the cigarette that's much like the RJR Camel Light, that upon high exposure, medium exposure and low exposure, that cigarette or smoke from that cigarette produced squamous cell metaplasia in the larynx of the rat; correct?
MR. PLESEC: Objection.
A. Again if we assume that the reference is that Kentucky reference that we've already talked about, that reference product showed positive squamous cell metaplasia endpoints.
Q. Do you have an opinion as to whether cancer of the larynx in man is caused by cigarette smoking?
MR. PLESEC: Objection, outside the scope of his expertise.
A. I don't know.
Q. If we assume that cancer of the larynx is higher in nonsmokers than it is -- is higher in smokers than it is in nonsmokers, wouldn't this test give us some biological explanation for why that might be?
MR. PLESEC: Objection.
A. I don't know. We're way outside my area.
Q. Okay. The Premier did still have some -- did

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still cause some metaplasia of the larynx; correct?
A. The -- at the high exposure level and the medium exposure level, according to this chart, there was one plus, so I guess I would interpret that as some squamous cell metaplasia.
Q. How would you interpret five plusses?
A. Significantly more than one plus.
Q. Is five plusses the highest this particular test goes?
A. I -- I really don't know. I'm not an expert in this test.
Q. And if we look on page 6201, does that show slides of the damage caused by the various smokes?
A. I don't know if --
MR. PLESEC: Objection.
A. -- this is a slide of the particular pathology from this one experiment or whether this was intended to demonstrate what squamous cell metaplasia is. I don't know.
Q. Well it compares the reference cigarette, the new cigarette and a con -- control; correct?
A. Yeah, I -- I suppose it does, so it may be actual slides from that pathology. I don't know.
Q. The next study is the 90-day inhalation study of the hamster; correct?

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A. That's correct.
Q. And again in this case the reference cigarette, which is similar to RJR commercial cigarettes, causes extremely high levels of squamous cell metaplasia in the larynx of the hamster; correct?
MR. PLESEC: Objection.
A. Again assuming that that is the reference cigarette, there are five plusses at each of the three exposure levels as endpoints for squamous cell metaplasia.
Q. And regardless of the exposure, high, medium or low, the reference cigarette caused extreme squamous cell metaplasia; correct?
MR. PLESEC: Objection.
A. Well I see five plusses. I don't know whether that's extreme or whether that's maximum. I have no idea.
Q. Do you see the results of the mouse skin painting test here?
A. They're probably not in this package is my guess, because if you remember, back on the survey slide it said "In Progress."
Q. Do you recall what the results of the mouse skin testing were?
A. I recall in a general sense.

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Q. And what do you recall in general?
A. A significant reduction in mouse skin tumorigenicity with the new product.
Q. And with the reference cigarette, significant tumorigenicity shown?
MR. PLESEC: Objection.
A. Well, the mouse skin tumorigenicity from the reference cigarette, my recollection, was typical of any product -- any tobacco burning product. The tobacco heating product showed a major and significant reduction in tumorigenicity.
Q. From this Premier cigarette we can really draw two conclusions; correct?
MR. PLESEC: Objection.
Q. One conclusion would be that apparently with the Premier cigarette, you have been successful in at least reducing some of the substances in smoke that lead to biological activity; correct?
MR. PLESEC: Objection.
A. I think I would characterize that conclusion a little differently. I would say that the Premier cigarette, because it heats tobacco rather than burns tobacco, demonstrated a major reduction in many chemical constituents and demonstrated a concomitant major reduction in a number of biological assays.

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Q. The other conclusion that we can draw from the same set of tests are that regular cigarettes cause numerous adverse biological consequences on numerous biological tests, including in vitro cellular tests and in vivo inhalation tests and mouse skin painting tests; correct?

MR. PLESEC: Objection.

A. I think one of the things that's clear to me as a -- as a person who is not skilled in this area, it's still clear to me that cigarette smoke from tobacco burning cigarettes elicits a positive response in a number of assays.

Q. Well actually can't we say that cigarette smoke shows adverse biological activity in in vitro testing? Right?

A. We --

MR. PLESEC: Objection.

A. -- see positive endpoint -- endpoints in a number of in vitro assays.

Q. And just so the jury understands, a positive endpoint in an in vitro; that is, out of the body, biological assay test is a negative thing, correct, a bad thing?

MR. PLESEC: Objection.

A. I'm not the right person to interpret that. I'm

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not a biologist.

Q. Well just as a matter of common sense, usually when you test products on lines of cells, you don't want those products to cause, for instance, mutation; correct?

MR. PLESEC: Objection.

A. I think in a qualitative general sense, to me as a layman, probably to you as a layman as well, that probably makes sense.

Q. Okay. We've also seen that smoke from standard cigarettes through this Premier testing creates negative effects upon inhalation of at least two animals, the rat and the hamster, and that is, when I say "negative implications," it creates squamous cell metaplasia on relatively short exposure, 90 days; correct?

A. Again I'm not an expert in the area. My interpretation of these slides we've looked at is that exposure to smoke from tobacco burning cigarettes such as the reference product here did in fact show positive results on a squamous cell metaplasia inhalation test.

Q. And again positive results on a squamous cell metaplasia test, positive results are bad; right?

MR. PLESEC: Objection.

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A. Again I'm a layman in the area. I can't speak to it as a scientist. In general, I would say a positive test is -- I don't know whether it's bad or not in terms of disease, but obviously you would prefer something that is not active in that biological test.

Q. And isn't it also safe to conclude that if the animals continued to be exposed more than 90 days, the test results; that is, the squamous metaplasia, would only get worse?

MR. PLESEC: Objection.

A. I don't know.

Q. That would make sense, wouldn't it?

A. I don't know.

MR. PLESEC: Objection.

Q. And as we all know, people usually smoke cigarettes, including cigarettes like the reference cigarettes, for much more than 90 days; correct?

MR. PLESEC: Objection.

A. Most smokers smoke for periods longer than 90 days I would -- would be my guess.

Q. Many smokers smoke for a lifetime; correct?

MR. PLESEC: Objection.

A. I would guess that many smokers do.

Q. Do you know whether assays were made of the

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lungs of those animals exposed to cigarette smoke in the Premier testing?

MR. PLESEC: Objection.

A. I don't know exactly the extent of the biology that was conducted in that -- in that way.

Q. So you can't say for -- with any certainty whether or not histopathology was done upon the lung tissue to determine whether emphysema or the precursors of emphysema was present; correct?

MR. PLESEC: Objection.

A. I know at the end of animal studies pathology is conducted. I don't know the extent of it. I don't know what the results are. I'm just not an expert in the field.

Q. In looking at the exhibit that I've handed to you, there doesn't appear to be any report of the histopathology from the lung tissue of the animals exposed via inhalation; correct?

A. Again I don't know to what extent that may or may not have been done. I'm not an expert in the area. I don't deal in this area.

Q. The Premier cigarette was in large part a marketing failure; correct?

MR. PLESEC: Objection.

A. I wouldn't call it a marketing failure as much

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as I would call it a commercial failure.
Q. Isn't it true that the benefits of Premier were never adequately conveyed to the public?
MR. PLESEC: Objection.
A. What benefits are you referring to?
Q. Well what do you understand the benefits of the product to be?
A. Well I'm -- I'm trying to -- to see what -- I mean, you asked the question about the benefits, so I'm trying to see what benefits you want -- want me to speak to.
Q. I'm just asking you generally whether that was your understanding.
A. Whether what was my understanding? I'm sorry.
Q. Was it your understanding that the benefits of the Premier cigarette were never adequately conveyed to the public?
MR. PLESEC: Objection.
A. Premier had a number of benefits. I think some were conveyed to the public; some were not conveyed to the public.
Q. Okay. What benefits were not conveyed to the public?
A. I think in general -- you're asking my overall opinion here. In general, the public -- except

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through some scientific newspaper articles or where a science writer had written a newspaper article speaking to Premier, I think there was not a lot of information about the biological test results to the layman in the test market areas.

Q. Okay. Was part of the reason that the biological benefits of Premier was not conveyed to the public because Reynolds was concerned that they would have to actually admit that the rest of their cigarettes were unsafe in order to effectively market Premier?

MR. PLESEC: Objection, way out -- well go ahead.

A. I don't agree with that at all. I think that is 180 degrees off the mark.

Q. I'm going to hand you a document that's been previously marked as Plaintiffs' Exhibit 1612. Have you seen this document previously?

A. I don't believe so.

Q. Okay. This document is entitled "WHITHER PREMIER?" and it's a document Bates stamp numbered 50826 9189 through 9192; correct?

A. That's correct.

Q. Okay. It says "WHERE DOES PREMIER STAND TODAY?" Correct?

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A. Yes.
Q. It states that "PREMIER is thought ... in some quarters -- both inside and outside the Company -- as the largest and most expensive marketing failure since the Edsel"; correct?
MR. PLESEC: Objection.
A. That's what it says.
Q. In the third paragraph it states that "PREMIER failed for reasons that were well understood. The concept addressed the greatest latent market demand that will ever exist in the tobacco industry. It was not executed and presented to the consumer in an effective way"; correct?
MR. PLESEC: Objection.
A. That's what it says.
Q. It said "The smoking experience was significantly inferior to existing products on the market"; correct?
A. Yes.
MR. PLESEC: Objection.
Q. And that could have been corrected; right?
MR. PLESEC: Objection.
A. And --
Q. That smoking experience could have been corrected by RJR; correct?

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A. This document doesn't say this here.
Q. I'm asking you.
A. Well I'm just trying to make sure what you are reading and what you're asking. Okay. I'm sorry. Now your question was?
Q. The smoking experience could have been corrected by RJR; correct?
MR. PLESEC: Objection.
A. "The smoking experience" meaning taste characteristics of the product. Premier was clearly deficient in terms of the taste characteristics. I think that was a major reason it failed in the marketplace. We've worked hard on improving the taste characteristics. Part of that's embodied in the Eclipse product, which is in test market now, and I personally believe with Eclipse we're not there yet either.
Q. Is it your understanding that the Premier product was raced to market by F. Ross Johnson in the hopes of boosting the stock prices of R.J. Reynolds stock?
MR. PLESEC: Objection.
A. Well it would be my own personal opinion. I think that may have been part of the motivation. I certainly read -- read the book as well.

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Q. Well I guess I'm asking you for a little more than that since you lived through the book. Was that your --

A. Well --

Q. -- perception as a --

A. -- I wasn't --

Q. -- as a cigarette designer at the time, that Premier was really being rushed to market before it was ready in part because you had a CEO of the overall corporation who had certain objectives that might have been different from those of you who were designing the product?

A. My --

MR. PLESEC: Objection.

A. My personal opinion -- and it's only that because I wasn't privy to the discussions on whether to launch or not at -- at that time. My own personal opinion was that Mr. Johnson's desire to get to the market did in fact get it to the market before it was ready. I believe that, on the other side of the coin, scientists always have a tendency to get everything just right before it's out in the market, and therefore necessarily there's some middle ground where you may want to launch a product that's not a hundred percent where you want it, but to get it out

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there when it's a B plus instead of an A and then improve it in the market is a viable marketing/product development approach, so they're somewhere in the middle.

(Discussion off the stenographic record.)

Q. I have to ask this question: --

A. I can tell.

Q. -- Was Premier to the B-plus level or were we still somewhere down around the C to C-minus level on that from your perspective as a scientist?

MR. PLESEC: Objection.

MR. O'FALLON: Fair question, though.

A. Well it is an interesting question. I think that -- I think the answer is complicated. I don't think that Premier in terms of attracting consumers with its taste and odor or aroma as well as the ash characteristics -- I think those were all perceived by the initial trier as negatives.

However, that said, I think if a smoker smoked Premier for an extended period of time, a carton or two, you'd be surprised how quickly they could get used to it and like that as a product, and I speak from personal experience.

Q. Okay. So to go to the second part of that, it's really that what happened at RJR is you didn't

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adequately market the advantages of the product; right?

MR. PLESEC: Objection.

A. That's a pretty broad question. Can you tell me more specifically.

Q. Sure. Let me just -- let's go back to the document. It says "... and the product advantages were prevented from being communicated effectively"; correct?

A. Let me read the whole sentence. "The smoking experience was significantly inferior to existing products on the market, and the product advantages were prevented from being communicated effectively." That's what it says.

Q. And that was --

Was that also your understanding, that marketing really dropped the ball as far as marketing this particular product?

MR. PLESEC: Objection.

A. No, I don't think that's a -- a fair characterization at all, that marketing dropped the ball. I agree with this statement as it's written that I just read, but I don't believe marketing dropped the ball.

MR. O'FALLON: Why don't we take a quick

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break.

THE REPORTER: Off the record, please.

(Recess taken.)

BY MR. O'FALLON:

Q. Doctor, I just have a few cleanup questions to ask. I've asked you to look at your expert report and specifically page 3,028 of the transcript. It indicates here that you were an invited speaker at the National Cancer Institute symposium on FTC test methodology in December of 1994. Did you generate a paper as part of that presentation?

A. I generated a summary of a presentation I made to that group, which was submitted and became part of the proceedings of that meeting.

Q. Okay. Is that document among the publications that have been made available today as part of your deposition?

A. No, it's not.

Q. Is that document available?

A. Yes, of course. It's -- the entire proceedings is available as a government document available. I of course have a copy of my report as it's in there.

MR. O'FALLON: Counsel, would you mind making available a copy of that report?

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MR. PLESEC: Sure, we'll take that request under consideration.

MR. O'FALLON: Okay.

Q. We've now had the opportunity to talk about your expert opinions for a number of hours. Is there any major topic or any of your major opinions that we have not touched on in some fashion that you can think of?

A. Oh, we've talked about a lot of different things, often in not such a direct flow, but, I mean, I can't think of anything unless you can think of something you want to ask.

Q. You don't intend to talk at the trial in this case at all about fire safety; correct?

A. I wouldn't see that as part of this trial at all.

Q. Okay. Do you intend to talk in any detail about the Eclipse project?

A. I wouldn't see a lot of detail, but I would see some reference to the Eclipse as further developments beyond Premier, what the Eclipse product is, perhaps what some of the chemistry might -- in a general sense is without getting into a lot of details, maybe a little bit of the biological testing that was done and the fact that it's in -- it's currently in test

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market.

Q. Okay. Why don't you tell me about the biological testing that was done in that instance.

A. Well the Eclipse -- let -- if -- if you would allow me, back up and I'll give you just a little bit more than you probably are asking for.

Eclipse differs from a Premier in that it burns a very small amount of tobacco in an attempt to improve the taste characteristics relative to Premier. We still see major reductions in chemistry and we've had a -- an ongoing problem -- problem -- an ongoing project to evaluate the biology of Eclipse, and we see as in Premier but not to the extent of Premier major reductions in biological endpoints, including inhalation tests and including mouse skin tumorigenicity.

Q. Okay. Is the longest inhalation test that you've conducted on Eclipse the 90-day inhalation study?

A. As far as I am aware of, yes.

Q. Okay. And just if I'm recalling back to the document we had in front of us about Premier, is the testing you're looking at the development of metaplasia in the larynx of both the hamster and the rat? Are those the two inhalation tests that were

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done on Eclipse?
A. That's my understanding.
Q. Okay. And do you recall what level of metaplasia was produced by the smoke from Eclipse in those two studies?
A. I don't re -- I don't recall the exact results. There was a major reduction in squamous cell metaplasia, I don't think to the degree that we saw for Premier. Quantitatively I can't answer your question.
Q. Now how about on the cellular tests, the Ames mutagenicity test, the sister chromatid test and the other basically what we call cellular tests?
A. Yeah, the in vitro tests also showed major reductions, but not quite to the extent that we saw for Premier. I think that's a general theme for Eclipse, again partially because we're burning very small amounts of tobacco. The chemistry is greatly reduced, but not to the extent of Eclipse. The biology seems consistent with that.
Q. And how about the mouse skin painting tests?
A. There were major reductions in mouse skin tumorigenicity I think on a per-milligram-of-tar basis per cigarette, certainly not to the extent that we saw for Premier.

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But I do see Eclipse testimony as an important part of my testimony, along with Premier.

Q. What is the delivery of nicotine from an Eclipse cigarette as measured by the FTC method?

A. There's two versions of product. There's a -- a lights and a higher-tar level. The lights, I believe, is about .1 milligram per cigarette nicotine. The higher-tar-level product is about .2 milligrams per cigarette nicotine.

Q. Okay. And what are the relative tar readings for those two cigarettes?

A. Respectively 2 and 3 milligrams.

Q. Okay. And just so we have a clean record, for the Eclipse Lights, we would have .1 milligram of nicotine and 2 milligrams of tar as measured by the FTC method; correct?

A. I believe that's right.

Q. And for the Eclipse Regular, we would have .2 milligrams nicotine and 3 milligrams tar as measured by the FTC method; correct?

A. I believe that's right.

Q. What were the relative FTC tar and nicotine measurements for Premier?

A. Premier was an 8-milligram product, and the nicotine, I believe, was -- I've just drawn a blank.

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I think it's .4.
Q. And just so the record's clear, for Premier the FTC measures would be .4 milligrams of nicotine and 8 milligrams of tar?
A. I believe that's correct, and I'm certain on the tar -- tar yield. On the nicotine I'm just drawing a blank, sorry, but I think .4 is right.
Q. And just so we're clear, as of 1994 the lowest tar-to-nicotine ratio cigarette that RJR had on the market or has had on the market was -- had a tar-to-nicotine ratio of approximately 10; right?
A. I think that's a ballpark number, that's correct. I mean, we can certainly find an exact number for the lowest tar-to-nicotine ratio product in our -- in our records, but I think that's a reasonable estimate.
Q. Was there ever testing done on Premier to determine the amount of nicotine the smoker -- the typical smoker received upon smoking Premier?
A. I --
MR. PLESEC: Objection.
A. I believe there were some studies with smokers measuring plasma nicotine levels, and I think there were some studies measuring urine cotinine and other nicotine metabolites.

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Q. Do you recall what the plasma nicotine level achieved by Premier smokers was on average?
A. I don't recall offhand, no.
Q. Was the same testing done for Eclipse?
A. Same testing has been done for Eclipse.
Q. Do you know what the average blood -- blood level of nicotine has been for Eclipse smokers?
A. I don't recall offhand. Again I know we've -- we've done those studies. The -- the results have been presented numerous times to various scientific groups.
Q. We see numerous references to an optimum nicotine level. Has RJR concluded what the optimal nicotine level is for a cigarette?
MR. PLESEC: Objection.
A. I don't believe RJR has concluded that there's an optimum nicotine level in the first place, and I certainly don't believe that there is an optimum level. My experience in this industry and in product development suggests that there's a range of products that consumers will buy in the marketplace and that their -- that their nicotine yields from those products and probably their nicotine intake vary considerably. I don't think there's an optimum yield or an optimum blood level.

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Q. Based on the blood plasma testing that RJR has done concerning the level of nicotine in the blood, what is the range, the general range, that the blood nicotine level -- for the blood nicotine level of smokers; do you know?

A. I understand your question. I don't recall the numbers to give you a range offhand. Again this is not an area that I go back and look at detailed information very often. We certainly have that kind of information, though.

Q. I believe one of the ranges we saw in some of the documents was 15 NGs. Is that approximately the range that you understand?

MR. PLESEC: Objection.

A. Well I don't think that was a range; that's a number. Nanogram per -- per deciliter --

MR. PLESEC: Milliliter.

A. Per milliliter, yeah, those -- I mean, that -- that order of magnitude is -- is probably correct. I don't know about the absolute number 15.

Q. Would 15 nanograms per milliliter plus or minus 1 or 2 be about the range that you'd understand?

MR. PLESEC: Objection.

A. Again I don't know what the range is. I'm saying order of magnitude, I think that's a

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reasonable number, but I don't think what we saw in the document reflects a range. Actually I think that was just a number, not a range.

Q. No, I understand it was just a number. I'm asking you whether the range, to the best of your knowledge, would be that 15 NGs per milliliter plus or minus 1 or 2.

A. No, I wouldn't be able to say that at all.

MR. O'FALLON: Do we have the remaining articles?

MR. PLESEC: I think we do.

Have you taken a look at these to see if these --

THE WITNESS: I looked at them when Jonathan brought them in.

A. This is the last article in the list, which unfortunately was not --

Q. I tell you what. Let's -- let's just try to do this in a -- in a routine fashion --

A. Sure.

Q. -- so we have a record preserved. Let's go --

A. Certainly.

Q. -- to the list.

A. Okay. On the list --

Q. I believe you had circled those that we hadn't

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provided; correct?
A. That's correct.
Q. Why don't you just go through there and read into the record the documents that you've now produced, and then --
A. Okay.
Q. -- on the list put a big X through the circle.
THE WITNESS: Let me borrow your red pen there, please. Thank you.
A. Okay. The first document I have is a publication in the Journal of Fire Sciences. It's "A Comparative Ignition Propensity Study of Foreign and U.S. Cigarettes Using the NIST," N-I-S-T, "Cotton Duck Mockup Ignition Test Method." That is on my CV reference number 20. It was not in the original stack. There it is.
Q. Thank you.
A. The next is -- is actually a manuscript. It is reference number ten on my CV. It's a manuscript presented at the 36th Tobacco Chemists Research Conference in Raleigh, 1982, and at the CORESTA 1982 symposium also, which happened to be in Winston-Salem. The title of it's "The Effects of Cigarette Paper Permeability and Air Dilution on Carbon Monoxide Production and Diffusion Through the

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Cigarette Wrapper." This is the manuscript, and there are handwritten portions of it because that's the best copy we had.

Q. Thank you.

MR. PLESEC: Just let me note for the record that the -- the title of the paper on the CV says "Diffusion from the Tobacco Rod." That has been crossed out on -- on the document that's being produced and it now reads "Diffusion Through the Cigarette Wrapper."

A. Okay. So that's number ten.

And then the next one is entitled "PARTICIPATION OF THE ANTHRACENE/TRANS,TRANS-2,4-HEXADIENE EXCIPLEX IN ANTHRACENE PHOTODIMERIZATION." That's reference number nine on the CV. It's a symp -- it was presented at the Symposium on Organic Photochemistry presented at the Division of Petroleum and Chemistry, the American Chemical Society, in Honolulu, 1979.

Q. Thank you.

A. And then the next is reference number 11, "THE EFFECT OF TOBACCO" ROD "MOISTURE ON THE REMOVAL OF CIGARETTE SMOKE BY THE TOBACCO ROD." That was a presentation at the 37th Tobacco Chemists Research Conference in Virginia and at the 1983 CORESTA symposium in Florence, Italy.

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Q. Now are there still two documents that are missing?
A. There are two documents that are missing. The first is number three, "Mechanistic Aspects of the Sensitized Cis-Trans Photo-isomerization of 1,3-Dienes." That was a presentation at the American Chemical Society, Division of Petroleum Chemistry. I've been -- my -- my secretary has been unable to locate that particular manuscript so far.
Q. Okay.
A. The second is number 14, which is actually a manuscript for an invited paper at Kimberly-Clark Central Research Organization in Atlanta. The title of it's "Processes Occurring in a Burning Cigarette." That's an overall summary of physical aspects of a burning cigarette, how smoke is formed and as well as how filters and air dilution and expanded tobacco work to define cigarette performance characteristics. It actually is -- many aspects of this manuscript are actually very similar to some of the testimony.
Q. Okay. Kimberly-Clark is a manufacturer of tobacco sheet; correct?
A. Kimberly-Clark's primary connection with the industry is -- is selling cigarette paper to the

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industry. They have been involved in reconstituted sheet manufacture through their French subsidiary.

Q. Has --

A. Now -- I'm sorry.

Just to make the record complete, Kimberly-Clark no longer owns that business. The tobacco-related business has been spun off as a separate company.

Q. Has Kimberly-Clark ever sold reconstituted sheet to R.J. Reynolds?

A. Not to my knowledge. We've had our own reconstituted sheet production facilities, and I'm not aware of any case where we've bought reconstituted sheet from the Kimberly-Clark subsidiary. Actually, also for the record, that subsidiary is -- is LTR in France.

Q. Has Reynolds ever sold reconstituted sheet to any other cigarette manufacturer?

MR. PLESEC: Are you talking about a cigarette manufacturer?

MR. O'FALLON: Right.

A. Actually I think we may have in the last several years. I can't recall the details, but I -- I do recall there were some discussions with another manufacturer about selling some of our excess capacity on reconstituted tobacco.

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Q. Which manufacturer was that?
A. It was either Lorillard or American Tobacco Company. Of course American Tobacco Company -- Company no longer exists.
Q. Which of your reconstituted sheets were you going to sell to them?
A. Again I don't know the details, but I would assume it would be a standard form -- formulation, not one of the many varieties that we have.
Q. And when you say "a standard formulation," what do you mean?
A. I mean a standard formulation probably without diammonium phosphate, for example, without -- well and possibly made to their specifications. I don't know. We -- we have excess production capability in our reconstitution process at this point.
Q. Have you ever sold sheet to either Lorillard or American Tobacco that contained additional extract?
A. I don't believe we've ever done that at all for commercial purposes, and I don't believe that we've sold that to any of our competitors. Again I don't know the details of any arrangements with a competitor, but I don't think -- it would be, in my estimation, I don't think that's happened.
Q. As to the two articles that are missing, if you

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do come across those, will you give them to your lawyer so that they can send them to me?

A. Be happy to. I'll go back to my files when I return home.

MR. O'FALLON: At this time I would like to conclude the expert portion of the deposition.

THE REPORTER: Off the record, please.

(Recess taken.)

BY MR. O'FALLON:

Q. Dr. Townsend, for the record, could you just add these four articles that you just provided to us to --

A. 4806.

Q. -- to Exhibit 4806, and we'll just incorporate that as part of Exhibit 4806.

A. Be happy to.

MR. O'FALLON: Thank you. I have no further questions.

DIRECT EXAMINATION

BY MR. PLESEC:

Q. Dr. Townsend, yesterday during the examination by Mr. O'Fallon on the subject of selective reduction of controversial compounds, you gave testimony regarding the possible use of solvents to remove PAHs from tobacco. Do you recall that testimony?

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A. Yes, I do.
Q. Just so the record is clear, as I understand your testimony, it was to the effect that Reynolds after exploring the use of solvents to reduce PAHs decided not to utilize that as a selective reduction technique; is that correct?
MR. O'FALLON: Objection, leading.
A. Reynolds decided not to use solvent extraction for PAH or benzo -- benzo[a]pyrene reduction.
Q. And will you articulate for the record, please, the reasons why Reynolds decided not to use that as a selective reduction technique.
A. There were a number of reasons as far as I can tell from the internal literature. The first was that extraction of -- of tobacco to -- to reduce benzopyrene and other PAHs in fact gave resulting tobacco that was quite fragile and very difficult to make into good cigarette rods, so there were -- there was a practical issue there.
There was also the other very practical issue in that the reduction of benzopyrene by solvent extraction unfortunately resulted in an increase in another class of constituents that was of concern, and that class is phenols. So we did effect a reduction in BaP and presumably other PAHs, but

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unfortunately we saw an increase in phenols as a class.

A third issue that prevented its introduction was there was consumer acceptance studies done, smoker studies, and products made with those rods in spite of the fact that -- that there were physical problems making the rods, smoking characteristics of those rods were unacceptable. There were a number of other issues like residual solvents that were probably less important in making -- in Reynolds coming to the overall decision not to use tobacco extraction, but there were a number of issues. Residual solvent was one issue that was less important.

And I think the overall testimony that I've made about benzopyrene is also consistent with Professor Wynder's conclusion about the practic -- the practical -- the lack of practical nature of benzopyrene reduction through solvent extraction, which ultimately found its way into the Surgeon General's report in 1979.

MR. PLESEC: Thank you, Doctor. No further questions.

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EXAMINATION

BY MR. O'FALLON:

Q. Doctor, did you ever look at chemosol as a possible treatment method for the removal of benzopyrene and other constituents of tobacco?

A. Chemosol was evaluated at R.J. Reynolds.

Q. Was it evaluated independently of the industry's evaluation of chemosol?

MR. PLESEC: Objection.

A. The best I recall -- it's been a long time since I've looked at that -- I believe there was internal work at Reynolds conducted on chemosol. In fact, I'm not familiar with an industry effort on chemosol.

Q. It wasn't your understanding that the industry got together and basically all the manufacturers set up an ind -- independent testing facility and ran it through their attorneys?

MR. PLESEC: Objection.

A. I'm not aware of that. I think there was an evaluation of chemosol within Reynolds' research and development group, though.

Q. And what was the result of that evaluation?

A. I frankly have forgotten. I'd have to go back and look.

MR. O'FALLON: I have no further

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questions.

THE REPORTER: Off the record, please.

(Deposition concluded at 4:09 o'clock p.m.)

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C E R T I F I C A T E

I, William C. LaBorde, hereby certify that I am qualified as a verbatim shorthand reporter; that I took in stenographic shorthand the testimony of DAVID TOWNSEND at the time and place aforesaid; and that the foregoing transcript consisting of pages 349 through 591, Volume II, is a true and correct, full and complete transcription of said shorthand notes, to the best of my ability.

Dated at Las Vegas, Nevada, this 5th day of October 1997.

WILLIAM C. LaBORDE
Registered Professional Reporter
Notary Public

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C E R T I F I C A T E

I, DAVID TOWNSEND, the deponent, hereby certify that I have read the foregoing transcript consisting of pages 349 through 591, Volume II, and that said transcript is a true and correct, full and complete transcription of my deposition, except per the attached corrections, if any.

(Please check one.)

____ Yes, changes were made per the attached (no.) ____ pages.

____ No changes were made.

DAVID TOWNSEND
Deponent

Sworn and subscribed to before me this day of 199__.

Notary Public

My commission expires: (WCL)

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